The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXVI. May 8, 1937 No. 932

Long Live Our King and Queen

THE Coronation of King George VI and Queen Elizabeth, which THE CHEMICAL AGE celebrates in this issue, is an event of immense significance far transcending the personalities chiefly concerned. It is primarily an act of dedication on the part of the Sovereign and his Consort. Seeing, however, that this act is being made in the presence and with the assent of representative men and women from every part of the Empire, it assumes the character of a re-dedication of the British Commonwealth of Nations to the higher purposes for which in their conviction it was called into being. Moreover, the whole world is looking on with sympathetic attention while the British race is affirming afresh its devotion to causes and institutions which have a continuous history of nearly one thousand years.

His Majesty King George VI.

Two years ago THE CHEMICAL AGE rejoiced to take the opportunity of commemorating the Silver Jubilee of King George V. The background of British sentiment is the same now as it was then, but a fundamental distinction has to be drawn between the two occasions. At the Silver Jubilee the British peoples were looking back over twenty-five years of a then unfinished reign. They recalled joys and sorrows, triumphs and disasters, which their Sovereign had shared with them. Their feelings were chiefly those of gratitude to the man and of pride in his reign. Their thoughts were in the main of an epoch nearing its completion, and of tasks worthily accomplished.

The Coronation of King George VI strikes an entirely new note. There is no delving into past history here. Emphasis is wholly on the future. The King has only been on the Throne since last December, and his title to a high place on the roll of British sovereigns has yet to be earned. With the Coronation he will enter into his full heritage, and Westminster Abbey will echo the prayer that his reign will be as beneficent as that of his father. Hope, then, will be the dominant note struck during the Coronation ceremonies. A constitutional monarch such as unites the scattered units of the British Empire may seem to have a restricted field of activity. But the very restrictions which remove him from the controversies of his subjects make possible a personal authority unique in the history of kingship. The British Throne, with all its constitutional limitations, is the most commanding institution in the modern world, and the generation which is taking over from its elders the government and business of the Empire, looks to a new King for wise leadership in an unpredictable future.

The Coronation, rightly regarded, is the charter of the younger generation. The King is being crowned during a period of exceptional unsettlement in the world outside. There is a ferment abroad such as has not been seen since the days of the French Revolution, but now, as then, the British nations stand steady as a rock. They continue to give an example of good government, and their reputation in the international world of business has never stood higher. It is impossible to dissociate these two abiding elements of the British character. The maintenance of the dual tradition as long as King George VI's reign lasts, is of vital importance to the Empire and the world.

So far as the chemical industry is concerned there need be no fear that the new reign will be in any way less prosperous than the old. Amazing progress—we use the adjective in its most literal sense—has been made in every branch of pure and applied chemistry since the last Coronation, and those who are best qualified to judge are confident that even greater progress will be achieved in the years that lie ahead. We cannot but reflect that it was the great war that led in large measure to the establishment of the industry

on anything like its present scale, and it is preparation for defence that is affording it a degree of increased activity to-day, but it is only on the basis of lasting peace that the industry will make its best contribution to the common good, and from that point of view the recent awakening of chemists and chemical engineers to the wider influence they are capable of exercising upon local and national life is noteworthy.

If Great Britain, as the head of the Commonwealth of Nations, is to maintain her high place in the world, she must continue to be happy and prosperous. Individual happiness implies personal liberty, and prosperous trade cannot be assured without confidence and stability. The new King has inherited the essential elements for ensuring the progress of a contented people. He will swear before Almighty God in Westminster Abbey to devote his life to a service which only he can render.

It will be a great and proud moment in his life, and our readers will wish to be among the first to join with uncountable millions in the traditional but none-the-less keenly felt acclamation, God Save the King.

Notes and Comments

Society of Chemical Industry

PRELIMINARY details of the programme for the 56th annual meeting of the Society of Chemical Industry at Harrogate from July 5 to 9 indicate that the Yorkshire Section, whose privilege it is this year to entertain the Society, is determined to make the meeting a conspicuous social success. Of the fifteen items in the provisional programme, six are strictly concerned with business, seven are of a social character, and the other two comprise a selection of visits to works in adjacent industrial towns. This is the fourth occasion on which the Yorkshire Section has acted as hosts to the Society, the three former occasions having been at Leeds in 1895—when the section was only four years old—at Bradford in 1903 and at Leeds again in 1925. With the exception of the Cambridge meeting, in 1923, every annual meeting so far has been held in a large industrial centre, and the 1937 meeting at Harrogate is something in the nature of an experiment. We do not doubt that the attractiveness of the venue will appeal to an increased number of members, who have found it somewhat irksome to shut themselves up in a city atmosphere at the commencement of the holiday season. For those who desire to explore the industrial activities of Yorkshire there will be plenty of facilities, but the call of the moors and dales will certainly promote a more sociable feeling, and we shall be surprised if the experiment does not result in a record attendance, which, in turn, will be a good augury for next year's visit to Canada.

A Job for the Chemical Engineer

THE statesmanlike address which Sir Alexander Gibb gave at the annual dinner of the Chemical Engineering Group of the Society of Chemical Industry last week imparted a new significance to the hackneyed question: "What is a chemical engineer?" which visitors invariably ask at such functions. Primarily, of course, the chemical engineer is concerned with the design, construction and operation of plant in which matter undergoes change, but he has an infinitely greater contribution than that to make to the wellbeing of the community. We doubt whether more than a small proportion of chemical engineers have either the time or opportunity to do all the things that Sir Alexander enumerated in his definition of the ideal chemical engineer, but it cannot be denied that no one is so well placed to help and advise in many aspects of industrial planning, and indeed, none whose duty it is more so to do, than the chemical engineer. In these days of specialisation it might be argued that town planning and all the intricate problems associated with it should be left to the architect and the economist, but experience has shown that they have not always made a success of their job. The chemical engineer with time to devote to the subject could do a great deal towards more scientific planning if means could be devised for placing his specialised knowledge at the disposal of the local town planning authorities. We commend to the Chemical Engineering Group and the Institution of Chemical Engineers Sir Alexander's suggestion that they should invite outside experts to address them on the broader problems of industrial planning in order that their members might acquaint themselves with what is being done and what it is intended to do, and with those particular aspects to which their technical qualifications might profitably be applied.

Salt Union Merger

SOME forty companies have become merged in Imperial Chemical Industries, Ltd., since the present company was formed in 1926 by the amalgamation of the "big four" chemical undertakings of Great Britain, and if, as seems probable from the remarks of Lord McGowan at the annual meeting last week, the present negotiations with the Salt Union, Ltd., are successful, a further big step towards the centralisation of the control of the British chemical industry will be effected in the near future. An offer has been made by Imperial Chemical Industries, Ltd., to acquire the whole of the issued capital of the Salt Union, on the basis of £1 13s. 4d. preference stock of I.C.I. for each £1 preference stock of the Salt Union and £1 10s. ordinary I.C.I. stock for each £1 ordinary Salt Union stock. For a great many years there have been close commercial relationships between the two companies, originating from agreements entered into by Brunner, Mond and Co., Ltd., before Imperial Chemical Industries came into being. That association has latterly brought the interests into closer relation and the time has now come when, in the opinion of both boards, it would be to the interest of their stockholders to make that association permanent. As the scheme would give the ordinary shareholders in the Salt Union a slightly larger return and leave the preference stockholders no worse off, there is little reason to doubt that the offer will be accepted. The Salt Union was formed in 1888 to consolidate a number of salt manufacturing businesses and has a capital of £1,400,000.

The Coronation and the Chemical Industry

Messages from Presidents

We have received the following Coronation messages from the presidents of four of the principal organisations in the chemical industry. Several of the societies are presenting loyal addresses to Their Majesties on the occasion of their Coronation.

Institution of Chemical Engineers

Dr. W. Cullen, President

The Institution of Chemical Engineers, jointly with other important engineering bodies, is presenting a loyal address to His Majesty King George VI and his beloved Consort on the occasion of their Coronation. The members of the Institution realise only too well that words form a poor medium for expressing their loyal sentiments with regard to the Crown, but it is the only means available to them and their engineering colleagues.

The Institution did not attempt to do anything spectacular during the reign of his late Majesty King George V, nor has it any spectacular projects in view. It is one of the newer professional engineering bodies, having been founded only fifteen years ago, but its growth has been steady and its influence has probably progressed more rapidly than the membership. This is entirely due to the fact that it has always been jealous of the status of its students, graduates and members and will continue to develop along these lines.

It may be remembered that in 1925 the Institution had the pleasure of welcoming to this country a party of members of the American Institute of Chemical Engineers and their ladies, this being the first official joint meeting of the two bodies. This visit was returned in 1928, and a second visit to England of American chemical engineers took place last year at the time of the Chemical Engineering Congress. The programme for 1937-38 is now practically complete and some progress has even been made with that for the succeeding session. This is a somewhat unique position for an engineering institution, and is typical of the keenness of the members.

CORONATION PRESIDENTS

To Dr. William Cullen (left) has fallen the distinction of being the Coronation year president of the Institution of Chemical Engineers.

The British Association of Chemists has as its president this year Dr. J. Vargas Eyre (right), chief chemist of the Distillers Company.

British Association of Chemists

Dr. J. Vargas Eyre, President

When asked on behalf of the British Association of Chemists to contribute a message on the occasion of the Coronation issue of THE CHEMICAL AGE, I called to mind the sentiment expressed by Pasteur some sixty years ago when considering the problem of contagious diseases—

> "It would be indeed a grand thing to give the heart its share in the progress of science."

Could anything be more appropriate to this occasion or more helpful as giving a human touch at a time when the wit of a man seems to outweigh his better feelings the world over? Science, particularly chemistry, is being called upon increasingly to play its part in the realm of peace and in the uncertainties of war. Lessons are so slowly learnt and so soon forgotten that maybe we shall see once more the almost random choice of those to be called upon in national emergency. Surely we should do all we can now to ensure that those best fitted to discharge special duties have the fullest opportunity of placing at the disposal of the nation the chemical knowledge and experience they already have.

Society of Dyers and Colourists

Mr. F. F. Flinn, President

At the approach of the Coronation of His Majesty King George VI, in the atmosphere of general congratulations, the president of the council of the Society of Dyers and Colourists sends his greetings and best wishes to the editor of THE CHEMICAL AGE.

One feels that in the period in which we are living, the title of your periodical is very apt. During the reign of our late King George V, great strides were made.

It would be comparatively easy to elaborate at great length on the progress of the science with which our respective journals are intimately connected, but as space will not permit, one can only express the hope that the progress made during that period will be intensified in the present reign in the interests of our national scientific development.

My council has sent a Loyal Address to His Majesty and our wish is—"May the Reign of His Majesty King George VI be equally as illustrious as that of his father His Majesty King George V of Esteemed Memory."

British Chemical and Dyestuffs Traders' Association

Mr. Victor Blagden, President

While the outlook in the alkali trade is well maintained, there is an appreciable increase of the by-products from coal. Owing to the enormous development of the motor and aircraft industries, the consumption of solvents and dopes is

rapidly increasing and the plastics industry is progressing to such an extent that it is becoming difficult to keep up the supply of the necessary chemicals.

The greatest improvement in the metal industry is also creating a large demand for cyanides and flotation chemicals, and the higher prices of metals necessitate an adjustment in the prices of metallic salts. New pharmaceutical and photographic products are continually appearing and there should be great prospects of further development.

The chemical trade looks forward to wider fields of activity and considerable expansion during the new reign.

The Society of Public Analysts

A Coronation Retrospect

THE beginning of a new reign is an event that makes societies, as well as the individuals who compose them, survey their past and present position. The Society of Public Analysts was founded in 1874 by seventeen public analysts, including such well-known chemists as A. H. Allen, Redwood and Thomas Stevenson, and its aims were then defined. At the first annual meeting, in January, 1876, Redwood was re-elected president for a second year. There were then 65 subscribing members and five associates.

The early work of the Society was concerned with the development of methods of food analysis, and a long series of papers on the subject was published in "The Proceedings of the Society of Public Analysts" in 1875. In the following year the Society's journal, "The Analyst," was founded, and the opening words of its first number state that it appeared primarily as the organ of the Society of Public Analysts, and secondly as the representative of analytical chemists in general. At first the journal had a severe financial struggle, and after the end of its first year was taken over by two registered proprietors at their own risk, with an arrangement that they should print the proceedings of the Society and papers sent to them by the publication committee. It was not until 1891, when Hehner was president, that the Society re-acquired the ownership of its journal, and an editorial committee, with Dr. Sykes as the editor, was formed.

Among the presidents of the third decade were Dr. Bernard Dyer (1897-8) and Dr. J. Augustus Voelcker (1901-2), both of whom, happily, are still with us, and continue to take an active share in the affairs of the Society.

Gradually the scope of the Society's work extended. At first membership had been restricted to public analysts and their assistants, but in 1899 the rules were revised, and it was decided to admit qualified chemists who were not public analysts. In 1907 this development was officially recognised when the Society was incorporated under the title of "The Society of Public Analysts and other Analytical Chemists." Chemists other than those associated with the chemistry of food now began to join the Society in increasing numbers, and in 1912 Leonard Archbutt, chemist to the Midland Railway Co., was elected president.

At the present time the roll of the Society has reached 800, and the "other analytical chemists" greatly outnumber the public analysts, and include representatives engaged in chemical industries of every description. The Society works in close harmony with the Food Group of the Society of Chemical Industry, and for several years past it has been the practice for the two bodies to hold joint meetings at which papers of mutual interest are read and discussed. The subjects dealt with at these joint meetings have incuded fish and fish products, fruit, tea, and coffee, and the less-known constituents of milk.

There are now two thriving local branches of the Society, a North of England and a Scottish Section. Papers read and discussed at the meetings of these local sections are afterwards publish in the "Analyst."

The development of the Society's interests is reflected in the steady growth of its journal. The first volume of the "Analyst" contained 217 pages. In 1907, the first year after the name of the Society was changed, the number of pages had increased to 440, and the volume for 1936 contains 882 pages.

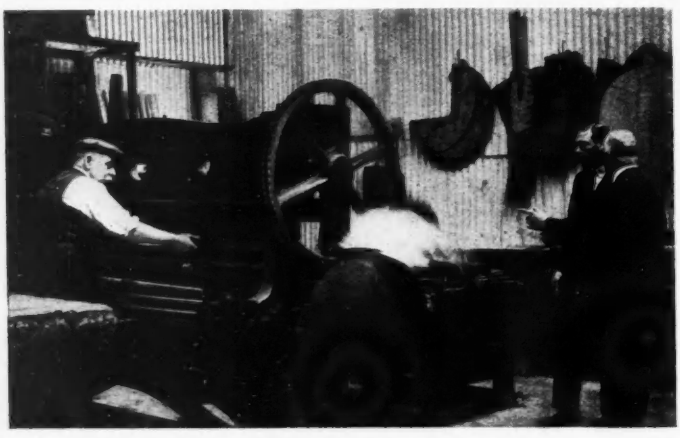
Oil and Colour Chemists

Coronation Year Innovation

CORONATION Year marks more than the opening of a new reign to the Oil and Colour Chemists' Association. This month, the first conference ever arranged by the Association will be held at the Palace Hotel, Buxton. The dates are May 28 and 29. Members will start arriving on the evening of May 27, when Dr. and Mrs. G. F. New will hold an informal reception.

The first session will open on the Friday at 10.30 a.m., when a lecture will be given by Professor M. Polanyi, on "Colours as Catalysts." From 2.15 p.m. to 4 p.m., the annual general meeting will be held, when the president will deliver an address. Other papers will be read at the Saturday session by members, but at the moment full details are not available. Sport has not been forgotten, for the members will take part in golf and tennis tournaments. The tennis will take the form of an American tournament, and full use will be made of the facilities offered by the municipality of Buxton. The golf competition will be held at the Cavendish Club to whom the Association is indebted for facilities. Arrangements have been made for ladies' visits to various places of interest in the district.

The council is hopeful that the opening of a new reign will open up wider avenues for the Association in the service which it renders to a highly specialised industry, and at the same time increase its membership.



THE KING AT GREENWICH

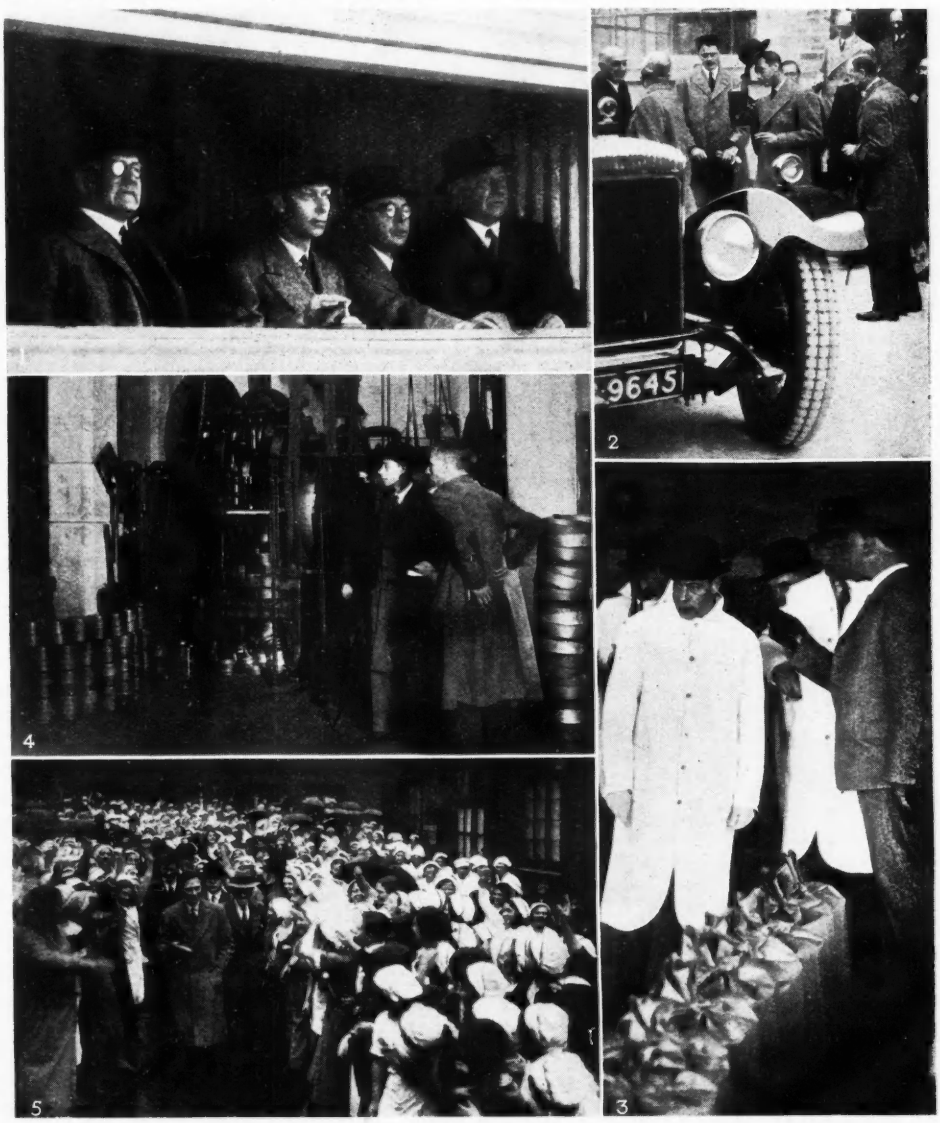
His Majesty the King, as Duke of York, visited the works of G. A. Harvey and Co. (London), Ltd., at Greenwich, on May 6, 1931. As president of the Industrial Welfare Society he was deeply interested in the various welfare activities of the company, concluding his visit by inspecting the canteen and visiting the sports ground. During his tour of the works he inspected with great interest the first bending machine purchased by the late Mr. G. A. Harvey when he started business nearly 60 years before, and which is still in operation. The accompanying illustration is reproduced by the courtesy of the editor of the "Harco Magazine."

KING GEORGE VI IN INDUSTRY

We are out to brighten the lives of our fellow-citizens in the workshops, to count them as men and women and not merely as instruments of production. When it is realised that their prosperity is our country's strength, their contentment her security and their happiness her best reward, and when it is known what the welfare movement has done in this direction, I feel there will be the necessary help forthcoming from those who wish to see the movement extended in the national interest.

HIS MAJESTY THE KING has always been concerned with industrial welfare and the above quotation from a memorable speech which he delivered as Duke of York is expressive of his personal conviction that industrial problems are fundamentally problems of human relationship, and that they can be and are being solved by goodwill and understanding. His Majesty became president of the Industrial Welfare Society on its foundation, and has taken a keen interest in its achievements and an effective part in its deliberations.

He has visited nearly a hundred and fifty works of all kinds in different parts of the country, and we are indebted to the editor of the " I.C.I. Magazine " for permission to reproduce the accompanying photographs of some of those outstanding occasions.



The King, as Duke of York, visited the Buxton quarries of I.C.I. (Lime) Ltd., where he pressed a button which fired a 30,000 ton blast of limestone. (1) With His Majesty in this picture are Lord McGowan, the Rev. Robert L. Hyde, director of the Industrial Welfare Society, and Mr. L. G. Sewell. In (2) he is seen leaving Buxton after his tour of inspection. The other pictures show His Majesty at a cement works in Kent (3) ; an engineering works in Gloucester (4) ; and (5) cheered by crowds of girl workers in a sweet factory.

After the Coronation: Some Likely Developments

By DR. E. F. ARMSTRONG, F.R.S.

Dr. E. F. Armstrong, F.R.S., president of the Association of British Chemical Manufacturers.

EVERY chemist will emphatically lay claim to progress which is amazing in chemistry, both pure and applied, during the eventful period since 1910. Equally he can with certainty foretell even greater progress to come. But the chemist is only a unit in the great world, whose problems are political instead of scientific or technical and influenced by human emotions instead of by facts. The scientist is being urged to play a larger part in politics, and he will be well advised to do so. He must, however, assist in the grand manner, taking a broad, impartial, scientific view of the problems, and not intervene on a narrow issue showing bias and partiality. Scientists, by taking opposite sides in matters of minor import, tend to cancel out each other and bring the influence of science into disrepute.

Things We Cannot Understand

There are many things to-day in modern economy which it is well nigh impossible to understand: one of these relates to gold. It is dug out of the ground at great expense in South Africa, Canada or Australia, where the mines are fitted with every device that modern engineering and science can give them, only to be buried again eventually in the vaults of a store in the centre of the United States, where is has to be guarded by a regiment of soldiers. The ignorant might say that if gold were wanted for any useful purpose, it would be easy to get it from these vaults at no cost, whereas the amount of human energy, labour, brains and material resources consumed in winning gold from the earth is enormous. This is all done to preserve that mysterious but all-powerful factor credit, on which the economic structure is built up.

At least many chemists are kept employed by the mining and metallurgical industries, and this is definitely one of those directions in which market activity in the next few years can be expected. New methods of winning the metals, new alloys and new uses of every kind for them should rapidly materialise, bringing great benefit to humanity.

Most Basic of all Industries

Above all, the chemist must turn his attention to the land, to agriculture and its products, for it is only on this, the most basic of all industries, that the continued prosperity of a country and of the world can ultimately rest. The growth and preparation for the market of many agricultural commodities can be industrialised just as soap or biscuits are and with the same regard for high quality. This work lies near at hand for the food chemist and he is already developing it along rational lines. As an example may be cited the canning of spinach, the green crop being grown on land adjacent to the cannery from seed supplied by it to the farmer, specially selected for the purpose, and therefore giving a product of constant character year by year. Such a procedure has obvious merit over the haphazard purchase of spinach of all types.

Economy in production is often helped by standardisation and where an industry is large and in many hands in many lands, as in dairying, there is an advantage in laying down specifications for guidance both in methods of analysis and for ancillary materials. This is very different from standardising foodstuffs which, broadly speaking, is undesirable though it may eventually be better for industry to undertake this work rather than leave it to a Government department.

In particular the chemist has work before him in improving quality in foodstuffs, though first perhaps he must establish what quality really is having regard to vitamins and other essentials about the chemical nature, structure and functions, of which the biochemist is now establishing the facts. The way is being cleared for a more general attack on this problem: on its solution depends very largely the health of the people. Such work stands in the forefront of interest.

There is no need to enlarge on the directions in which chemical work to help the land will develop, but it is worth while considering how such work is to be organised. Although discoveries will continue to be made by the individual, the bulk of modern research demands team work, and it must therefore be organised by research institutions or by industrial firms with large resources. Specialist societies will encourage such work and provide a conference table where the results can be critically discussed. Above all, it is highly desirable that they should provide leadership and act when necessary to guide and influence public opinion, sometimes possibly in oppostion to authority. Leaders still exist, but it is becoming more difficult to lead, since followers are scarcer owing to the over-development of the large committee system. Societies are losing in efficiency as their councils increase in numbers, and the system of geographical nomination involves and introduces the idea of representation.

The Spirit of Nationalism

The spirit of nationalism appears likely to stay with the world: it brings with it for the chemist both the synthesis of materials to replace those imported, a task which is likely to occupy him to an increasing extent, and the problem of raw materials. Britain has no oil, no natural gas, though the coal resources are large. At present coal is obdurate as a chemical raw material apart from the tar obtained in the gas-works and the coke oven; coal is still regarded essentially as a fuel to be burnt as such and its by-products wasted. Development in this field has a bad financial history and the solution of the technical problems is far from easy, partly because it is so costly.

Possibly the development of the products of the land is a little further off, but it also must be persisted in. Here in England we are deficient in sunshine with its power of synthesising carbohydrates and much else besides, but we do know how to take proper care of land which has the advantage that it is free from drought and floods. The final test of our stewardship of our native country is the acceptance of the fact that its condition and maintenance in good health matter most of all, far more than the products taken of it or the people who live by it; it must be passed on unimpaired to each successive generation. The problem here is partly one of education, and therefore a promising one for the chemist to exploit; in season and out of season the need for a greater scientific knowledge by all the people of every rank and station must be preached by each and all of us.

Trade and the Coronation

Employers Unite in Gift of Souvenir Programmes

TRADE and industry throughout Britain is co-operating loyally in making the Coronation of King George VI and Queen Elizabeth an event of strong and intimate significance to millions of employees. Not the least effective and generous method that is being widely adopted is the presentation of copies of the beautiful and comprehensive official souvenir programme to the rank and file of shops, offices and factories. It is a splendid gesture, one that will strengthen even further the ties between employer and employee at a time when all classes are united in hope for the reign which now begins.

The official souvenir programme has been prepared with the King's full approval, and His Majesty is anxious that it shall be in the hands of as many of his subjects as possible, particularly those who, being far from London, will follow the events of the historic occasion by radio. At His Majesty's express wish, this official programme is published by and on behalf of King George's Jubilee Trust, so that those employers who distribute presentation copies will not only be paying a gracious compliment to those now in their employ, but will be helping to promote the welfare of those who will be the workers of to-morrow.

Many firms, from insurance companies to shipping lines, from bankers to men's wear experts, have not rested content with merely a staff presentation scheme, but have extended it to cover their customers and clients. The result has been orders for many thousands of programmes wrapped with specially printed presentation bands. Such firms include—and those mentioned are chosen at random from a lengthy list—the National Bank of New Zealand, Ltd., the Prudential Assurance Co., Ltd., the Philco Radio and Television Corporation of Great Britain, Ltd., Boots Pure Drug Co., Ltd., Metro-Goldwyn-Mayer Pictures, Ltd., Austin Reed, Ltd., the Cunard White Star Line, the Automobile Association, the Canadian Pacific Railway, and Bryant and May, Ltd. Supplies in any quantity are available from King George's Jubilee Trust, but only if ordered without delay.

To present a copy of the official souvenir programme is to make a gift that will be treasured for many years to come. As well as being the only authentic guide to the Coronation it is a production on a scale compatible with the occasion, a thing of beauty, dignity and historic worth.

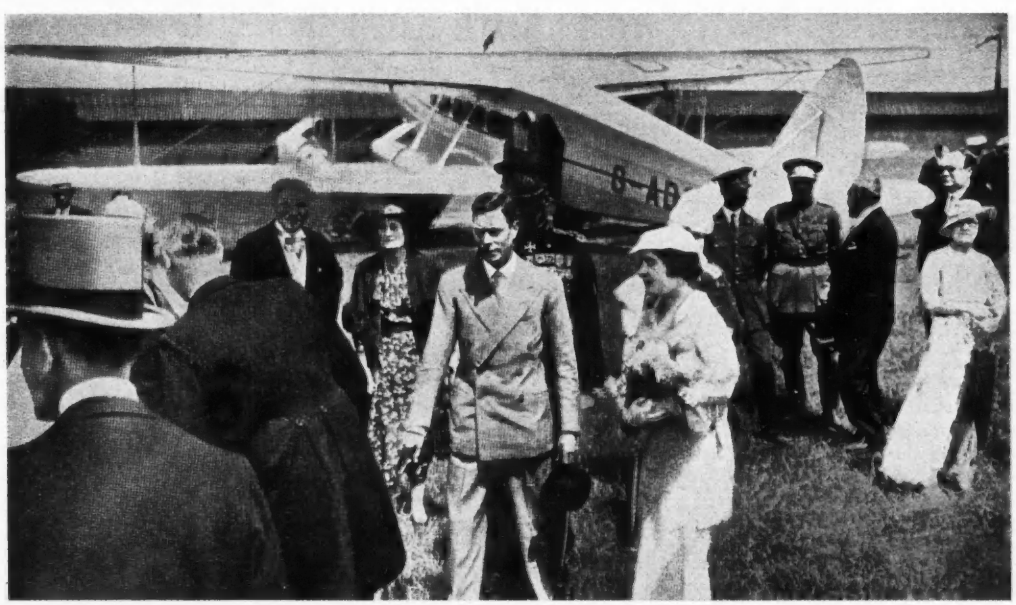
Embossed on the cover is the Royal Coat of Arms in full colours and gold. There is a personal message from His Royal Highness the Duke of Gloucester, and special photographs of Their Majesties the King and Queen, Her Majesty Queen Mary, and Their Royal Highnesses the Princesses Elizabeth and Margaret. John Masefield, the Poet Laureate, has contributed "A Prayer for the King's Reign" and the late Mr. John Drinkwater an article on "The King's Majesty," in which he outlines the significance of the new reign to the Empire.

A pictorial map of the route, a description of the procession, the full text of the service in the Abbey, with an introduction by the Archbishop of Canterbury, and a description of the Coronation ceremony by the Garter Principal King of Arms all make the official programme a vital key to the pageantry and solemnity of May 12. The programme is available in two editions—a standard edition at 1s. and a special edition at 2s. 6d. All applications should be addressed to King George's Jubilee Trust, St. James's Palace, S.W.

Their Majesties Visit an International Exhibition

THE British chemical industry was keenly interested in the visit which Their Majesties the King and Queen, as Duke and Duchess of York, paid to the International Exhibition in Brussels in 1935. On that occasion the British chemical section was organised by the Association of British Chemical Manufacturers, and the section was unique in that no names of firms or proprietary articles appeared anywhere in the exhibit.

The accompanying photograph shows Their Majesties on their arrival in Brussels. The Imperial Airways air-liner, "Draco," which they specially chartered at Croydon for both the outward and return journeys, is seen in the background.



The Outlook for Colloid Chemistry

By WILLIAM CLAYTON, D.Sc., F.I.C.

Dr. William Clayton, chief chemist of Crosse and Blackwell, Ltd.

REMARKABLE progress has been made in many lines of investigation in the physics and chemistry of the colloidal state since 1910. Undoubtedly the outstanding example is the conclusion by Hardy in 1912: "If the stray field of a molecule be unsymmetrical, the surface layer of fluids and solids, which are close packed states of matter, must differ from the interior mass in the orientation of the axes of the fields with respect to the normal to the surface, and so form a skin on the surface of a pure substance having all the molecules oriented in the same way instead of purely in random ways. The result would be the polarisation of the surface, and the surfaces of two different fluids would attract or repel one another according to the sign of their surfaces." The remarkable researches of Langmuir, Harkins, Adams, Rideal, Devaux, Gorter and others on the surface spreading of colloidal materials to elucidate molecular structure have followed Hardy's brilliant insight. Its influence is observed, too, in the later development of surface potential study, the theory of emulsions and emulsifying and wetting agents, and the numerous technical "interface modifiers."

A valuable tool in research is the ultracentrifuge due to Svedberg for sedimentation analysis in relation to particle size and molecular weights. Several of these expensive machines being now available important new data will result, especially in regard to colloidal aspects of biology (including bacteriology and enzymes). The rise of X-ray methods such as X-ray spectrography and X-ray diffraction will be more and more adopted to study not only fibres and proteins, but also the composition of gels and sols, including such changes as syneresis and coagulation. Again, much will be anticipated from the further extension of electron-diffraction methods investigating surface orientation effects.

Within recent years chromatographic adsorption analysis has yielded valuable aid in biochemical research. The preparation of special adsorbents, both as regards material and particle-size, will greatly extend its application. Interfacial adsorption quantitatively related to the validity of Gibb's equation still has its problems to solve; polymolecular layers and air/liquid electric potential effects are but two instances where further work is needed. A gap in our knowledge awaiting successful treatment is the determination of the interfacial tension: solid/liquid. Attempts to deal with this problem have so far been concerned with the influence of the grain-size of solid particles as affecting solubility or heats of solution. Meanwhile advantage is being taken of the admittedly limited technique of Bartell, who devised a cell for measuring the adhesion tension of a solid against a liquid.

Progress is certain also in regard to electrical effects in non-aqueous media (*e.g.*, cataphoresis), the structure of polymers, disperse systems in gaseous media (technically very important), protein denaturation and its reversal, and membrane and other phenomena in human and plant physiology. Medicine will benefit by the further study of lipoids, blood and general body fluids, considered as colloidal systems. Indeed bio-colloid chemistry is the great challenge. Thus Hardy, speaking of the hepatic cell: "Has the biologist any picture, even of the vaguest kind, of how so diverse a chemical factory can operate in a fluid mass, say 10^{-8} cubic millimetres in volume?"

Textile Dyeing and Finishing in the Future

By A. J. HALL, B.Sc., F.I.C., F.T.I.

ANYONE tempted to prophesy concerning the future trend of textile processing is inclined to review the more significant developments during the past twenty-five years, and assume that these will simply be intensified. Unfortunately this method can easily lead the prophet astray. For example, in 1910 it might have been predicted that fast dyeings in the future would be produced with vat dyes alone, for the anilide of beta-oxynaphthoic acid was not then known to be capable of forming the starting point for the preparation of the Naphthol AS series of insoluble azoic dyes which are now used so widely for shades of guaranteed fastness. Again, special calendering methods (schreinering and friction calendering) for securing a high lustre on cotton fabrics had a special importance in those early days, whereas the rapidly increasing use of rayon with its natural high lustre has made much less important those calender finishes which were not fast to washing.

Twenty-five years ago most textile chemists would have been tempted to prophesy that the old bleaching agents (active chlorine for cellulosic fibres, and hydrogen peroxide and sulphur dioxide for wool and silk) would be replaced in the near future by others, but this change has not come about and textile bleaching has changed very little fundamentally. The textile prophet must therefore take into account the possibility of unsuspected discoveries capable of radically influencing processing methods.

It is believed that the future will see progress made toward the replacement of the various fibres now in use by a single type of synthetic fibre produced from the same raw material (probably cellulose) but in different forms, each suitable for its special line of utilisation. There is some evidence of this change now. Thus rayon is being used in place of cotton and real silk, whilst a casein rayon is now being manufactured to take the place of wool. It is suspected that ultimately it may prove possible to produce one type of synthetic fibre, and then treat this with one or other of the available textile auxiliaries to give it such characteristics of lustre, handle, and dyeing and finishing properties as may be required.

At the present time the natural fibres and also the cellulose rayons are only moderately amenable to dyeing and finishing processes. It is believed that in the future this fibre defect will be overcome. Recent experience in the application of

synthetic resins to various fibres has indicated that the presence of a resin makes a fibre more thermoplastic, and therefore much more amenable to finishing operations in which special effects of handle and appearance are secured by the use of hot pressure treatments (calendering). Resins will also enable new or better dye affinities to be given to textile fibres, for example, cellulose fibres to be given wool and silk dyeing properties.

There can be no doubt that chemical manufacturers will continue to produce new complex substances (organic compounds especially) capable of beneficial application to textile materials. The complex ammonium, phosphonium, and sulphonium products now being produced for the benefit of dyers and finishers represents just a start in this direction. It is likely that in the near future compounds of this type will be just as useful and numerous as the soap substitutes now being marketed. With more textile auxiliaries available it cannot be doubted that dyers and finishers will be better able to produce colourings and finishes more permanent than is possible at present.

Future of the Nitrogen Industry

By E. B. MAXTED, D.Sc., Ph.D., F.I.C.

THE period of growth of the synthetic nitrogen industry in its modern form corresponds closely with that covered by the past two reigns. In 1910, the synthesis of ammonia had already been foreshadowed by the pioneer work of Haber and Le Rossignol and of Nernst and Jost on the ammonia equilibrium; but the possibility of successfully applying, on a large industrial scale, the combined high pressure and temperature necessary for a relatively high equilibrium percentage together with a reasonably high reaction velocity still awaited practical realisation by the work of the Badische Anilin- und Soda-Fabrik, under the influence of Haber and of Bosch, during the years immediately preceding and corresponding with the war.

Mr. A. J. Hall (left) foresees that in the textile dyeing and finishing industry guarantees of specific properties such as resistance to shrinkage, washing, fading, etc., will be more rigid.

Dr. E. B. Maxted (right) believes that the future of the nitrogen industry will be bound up with the saneness of the civilised world and with the place occupied by nitrogen as an instrument for the provision of adequate crops in normal times rather than with considerations of national emergency.

World-wide post-war developments of the synthesis in various forms took place, including that which was carried out in this country by Synthetic Ammonia and Nitrates, Ltd., at Billingham. For a number of years the production increased by annual amounts which are probably unprecedented in any other branch of chemical industry; and this growth was only checked by the period of economic depression. At the present time, there are many welcome signs of increasing consumption of nitrogenous fertilisers; and the ultimate potential agricultural requirements of fixed nitrogen undoubtedly represent a still larger tonnage than can be covered even by the vast plants which are now in existence.

As to the future, it is always difficult to forecast developments; but, since the economy of the direct synthesis of ammonia depends essentially on the cost of hydrogen, the fuller economic competition of hydrogen derived from existing sources of this gas, for instance in the large available supplies of coke-oven or other hydrogen-containing gases—by processes involving the separation of hydrogen and the return to the mains of the hydrocarbons and other constituents of relatively high calorific power for general heating purposes—with specially produced hydrogen, obtained by the ad hoc gasification of fuel in the initial form of a modified producer gas or from methane, will in all probability occur. The necessity for economies in special alloy steels may also give an impetus to the further development of catalysts which operate at somewhat lower temperatures, particularly in the temperature region below that in which hydrogen rapidly removes carbon from ordinary carbon steel.

From the standpoint of the national dependence on fixed nitrogen in time of war, the synthesis of ammonia suffers from the disadvantage of requiring centralisation of production in units of relatively large size, which—not only on account of their magnitude, but also by virtue of the localised concentration of highly inflammable and, in some sections of the factory, of highly compressed gas—are more easily vulnerable to aerial attack than would be the case with fixed nitrogen produced in smaller decentralised units. This factor may well encourage the development of other fixation processes, for instance of the cyanamide or nitride type, capable of being operated in scattered units and which do not necessitate the use of inflammable compressed gas. For this reason also, natural Chile nitrates will always retain considerable importance, particularly to a country which possesses adequately protected sea transport. The future of the nitrogen industry, in its present form involving the economic superiority of synthetic ammonia, may thus be bound up with the saneness of the civilised world and with the place occupied by nitrogen as an instrument for the provision of adequate food crops in normal times rather than that which it necessarily takes up during periods of national emergency.

The Future Development of the By-products of Coal

By G. E. FOXWELL, D.Sc., (Lond.), F.Inst.P., F.Inst.F., M.Inst. Gas E.

WHEN his late Majesty King George V was crowned, any discussion upon the subject of the by-products of coal would inevitably have started with ammonia, and would have been concerned with pointing out the benefits that were accruing to the coal trade from the increasing displacement of the beehive oven by the by-product oven, with consequent recovery of some 32 lb. of sulphate of ammonia per ton of coal carbonised. It might also have been mentioned that benzole was being recovered from the gas at a few works. There would also have been discussion of the possibility of making use of the sulphur evolved from the coal as sulphuretted hydrogen for the purpose of producing ammonium sulphate without the direct intervention of purchased sulphuric acid.

Advent of Synthetic Ammonia

Within the short space of 26 years, the beehive oven has virtually disappeared; whereas in 1913 over 9,000,000 tons of coal were carbonised in non-recovery ovens, in 1935 the amount was only 387,650 tons. Synthetic ammonia has taken the place of by-product ammonia so completely that for many years past carbonising technologists have been seriously discussing how to avoid producing ammonia. Although the potential capacity of synthetic ammonia plants is much greater than the world market for their product, by-product ammonia is not completely without hope. It would appear likely that it would again become profitable if arrangements were made to manufacture concentrated liquor, and to work it up in large central regionalised works. There is also the possibility that ammonium bicarbonate may take the place of sulphate for certain markets.

Looking backwards again, we find the gas and coking industries severely separated, and coke oven gas was regarded as practically worthless. To-day, the coking industry sells no less than 20,474 million cu. ft. of gas to the gas industry, and 6,326 million cu. ft. annually to other independent undertakings, besides using huge quantities in brick-kilns and steel furnaces under the same management. Coke oven gas is nearly the principal by-product of coal carbonisation, being equalled only by another product that was not generally esteemed at that period—benzole. Benzole is now recovered also in the gas industry. The future of coke oven gas and of benzole appears to be secure, as fuel. The huge chemical works based on the conversion of coke oven gas into methanol, synthetic ammonia and many other products do not seem to have any appeal to British coke oven owners, and the prospects of such an undertaking in this country are not of the brightest. Similarly, the chemical markets are not able to absorb more than a very small amount of the total benzole production.

The Problem of Tar Products

It seems difficult to forecast the future of tar products. There is a possibility—to put it no higher—that many of the substances now recovered from coal tar, such as the phenols and certain hydro-carbons, will be manufactured synthetically in the future. Pitch, too, has its limitations as a binder for briquetting in that it generates much smoke on combustion and spoils an otherwise smokeless fuel. There are many possible substitutes, though price considerations make pitch supreme—but it may not always be so. The use of tar for roads seems likely to increase. The quantity of low temperature tar produced is increasing, and we have yet to know whether it will continue to be used primarily as raw material for hydrogenation, or whether a new section of the tar industry will be based on this peculiar substance.

Steel works are beginning to discover that it pays them to extract the sulphur from coke oven gas used in the furnace in view of the effect on the sulphur content of steel. The Thylox process is making rapid strides abroad, and it would not be surprising if a good tonnage of pure rock sulphur from this source became available here.

Perhaps the production of oil from coal by the Fischer-Tropsch process is the most promising development of the future—the oil, however, would not be a by-product, but a primary product, and thus is hardly within the scope of this discussion.

Surveying the future of coal by-products as a whole, there seems to be ample scope for research to discover new by-products, new ways of treating old products, and in short to bring a great financial return to the coal carbonisation industry. It is a sobering thought that even with the high price of coke to-day, the success of a coking plant depends to a large extent on whether the gas can be sold. Some method of getting a return of 6d. per thousand cu. ft. from the gas without selling it to a possibly too-distant township is urgently needed.

Chemical Industries in India

Dependence on Imported Sulphur

ONE of the main foundations of successful chemical industries is a cheap supply of sulphuric acid. India lacks any indigenous source of sulphur of commercial size and up to the present no use has been made of the sulphide ores occurring at Bawdwin in the N. Shan States or at the copper mines in Bihar. Schemes have from time to time been formulated for the purpose, but have never been brought to fruition. India is therefore dependent upon imported sulphur for its supplies of this most important acid. Imports of sulphur in 1935/36, amounted to 26,000 tons and of sulphuric acid to 284 tons. The output of the acid plants in the country is a little over 31,000 tons of 100 per cent. acid. The manufacture is widely distributed, and is a healthy sign of growing activity in the chemical industries. The objects of manufacture are varied. In Bihar the acid is largely used for the preparation of ammonium sulphate from the coke by-product recovery plants and in the tin plate works, in Burma for refining oil products and in the Nilgiris for cordite. The output of ammonium sulphate amounted to 15,400 tons in 1935. Fairly large quantities of aluminous sulphates and alum are produced by treating the indigenous bauxite with sulphuric acid.

Saltpetre is produced in Bihar, the United Provinces and the Punjab by the lixiviation of nitrate bearing efflorescence formed near village sites after treatment with wood ashes. The crude product requires refining before use. The production amounted to over 12,600 tons in 1935. Although some is utilised as a manure and for gunpowder, the greater part is exported, the exports in 1935 being a little over 8,600 tons.

Magnesium chloride is produced from the natural bitterns of the Rann of Cutch and the Gulf of Cambay. The material is of high grade and has almost completely ousted the imported German product. There is also a small export trade.

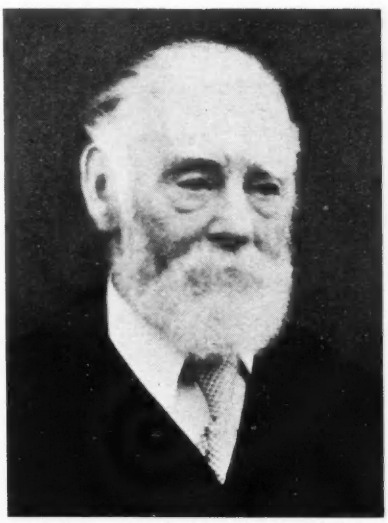
Throughout India use is made of the saline efflorescence occurring for the production of impure varieties of soda and similarly from the alkaline lakes in Sind. Some ten years ago, a large soda factory was built in the Indian State of Dhorangadhra on the little Rann of Cutch. The Shri Shakti Alkali Works were intended to produce annually the equivalent of 22,000 tons of sodium carbonite by the ammonia soda process. Attempts to commence production in 1928 and subsequently, proved abortive. The Magadi Soda Works which had a plant near Calcutta for producing caustic soda from carbonate imported from the Magade Lake in Kenya went into liquidation about 12 years ago. There is hope that various soda products will shortly be made in India by Imperial Chemical Industries, Ltd. Imports of soda salts amount to 69,000 tons per annum.

The Grand Old Man of Chemistry

Professor Armstrong's 89th Birthday

PROFESSOR HENRY E. ARMSTRONG celebrated his 89th birthday on Thursday, and although the Grand Old Man of Chemistry has not been among us for some months past, it is understood that his mind possesses its usual vigour.

What a wonderful life the Professor has led; he has seen practically the whole of chemistry, as we now know it, develop and has moreover known personally, or been in correspondence with, almost all those who have taken a hand in its development until comparatively recently. No one has taken a greater part in the encouragement and constructive criticism of the work of others who were often strangers until the correspondence begun. Professor Armstrong has always been a trenchant critic, often most so when his opinion of a worker was high, and he has retained in a remarkable way his power of grasping the essentials. His early text-book, Miller's Chemistry, was many years ahead of its time in its understanding of structural organic chemistry and played a part in stimulating many honours students. A few years ago we heard the professor forecast that many waste or down grade products — the Germans call them Abball produkte—of plants and animals would turn out to possess important physiological functions, and that they were by no means to be regarded simply as waste. This prophecy is now being verified in a number of directions.



Professor H. E. Armstrong, F.R.S.

His father was a merchant and a forceful character. The professor had no desire for the city and went as a student to the Royal College of Science in 1865, just as Hofmann left for Berlin. Horace Brown and Peter Griess were fellow-students; O'Sullivan was a junior instructor, whilst Tindall and Huxley were lecturers at the school in Jermyn Street, pulled down only during the last year. But his real teacher was Frankland, a master of his craft on the manipulative side.

Before long the young student was set to work to develop the methods of water analysis; later he went to Kolbe in Leipzig, whose character had not a little influence on Armstrong. He came back to London in 1870, and became Professor at the London Institution in Finsbury Circus the next year on a salary of £50 per annum, and was one of the first abstractors for the Chemical Society under Dr. Watts; in 1875 he became secretary of the Society.

A few years later in 1879, the City and Guilds Institute was founded, and the association of Armstrong with Ayrton and Perry begun, a friendship which had a profound influence on all three men. Finsbury was opened in 1883, the Central Technical College in 1884; Armstrong and Ayrton moved to South Kensington, and with Unwin and Henrici formed the unique quartet of individualists who brought the name of the college so high, and did so much for the development of rational practical technical education. The closing of the college on the merging of its chemical department with that of the Imperial College in 1914 was a great blow both to Professor Armstrong and to our educational progress.

The professor has been omniverous in his activities: hardly a science has escaped him; always he has aided progress. Geology early attracted his attention and he did a great deal of field work carrying a heavy camera. He has been a great walker of the hills and was happiest perhaps in Borrowdale, where he has introduced not a few to the mixed joys and trials of an ascent and descent of Great Gable.

In all branches of agriculture he has played a stimulating part both in encouraging the workers and the research stations and in laying down programmes for investigation. He has for many years been on the Rothamsted Committee, and as an enthusiastic and knowledgeable gardener served on the Scientific Committee of the Royal Horticultural Society.

To the sacred cause of education in schools and in colleges, for boys and for girls, he has devoted a great portion of his life, meeting all the obstacles which beset the pioneer: his influence has probably been profound even if only a tithe of his doctrines have been listened to by his countrymen. In no other matter is vested interest so strong as in education. Naturally the crusader must strike many hard blows and the rewards are few; it is remarkable that no English University has conferred an honorary degree on him.

Professor Armstrong with his coloured waistcoats has been an essential figure at all international chemical gatherings for some years past, and he has done not a little to promote international amity.

Several foreign degrees have been conferred on him.

To-day at 89 he is still alertly following all those subjects which have so keenly interested him during his long and distinguished career.

New Irish Alcohol Factory

Distilling to Start Next Week

THE ceremony of blessing the new alcohol factory at Cooley, County Louth (Irish Free State) was carried out last week in the presence of the directors and staff. The factory was to have commenced distilling early this year, but owing to unavoidable delays the first batch of potatoes will not be dealt with until May 13. Actual distillation will begin four days later. Work for some weeks will be confined to testing the machinery, the most modern of its kind in the world.

Good wishes for the success of the factory was expressed by Mr. S. A. A. Maas, managing director of the Saorstat Alcohol Distilleries, in thanking Father Boyle for performing the blessing ceremony. The Rev. B. Donnelly, chairman of the Potato Growers' Association, said they would be glad to have the co-operation of those in charge of the factory, to which they looked with hope.

Mr. Maas said he was glad to see the potato growers represented. They had had their little differences in the past, but they always tried to be friends, and in that spirit, no matter what differences they had, they hoped to solve them for the benefit of the country and the factory. When it began work in real earnest next October, he said, the factory would use 40 tons of potatoes per day, and would have a daily production of 600 to 700 gal. of alcohol. The factory would be under the charge of Mr. Zamarsky, master distiller, who would have an Irishman as an assistant. In the entire industry, Mr. Maas pointed out, only two foreigners would be employed. The other alcohol factories in the Free State were ready to start, he added, but no potatoes were yet available.

The Chemical Engineer and Industrial Planning

Need for Wider Interest in Public Affairs

SIR ALEXANDER GIBB, president of the Institution of Civil Engineers, was the principal guest at the annual dinner of the Chemical Engineering Group of the Society of Chemical Industry at the Waldorf Hotel, London, on April 30, and gave an address on "The Chemical Engineer and Industrial Planning."

If chemical engineering was to gain and hold that position in engineering which seemed marked out for it, he said, then the chemical engineer must look upon himself as something more than a chemical engineer. Apart from having considerable scientific knowledge, and technical training, and being experienced in and capable of the design, construction and operation of plant, wherein matter undergoes change, the chemical engineer should also have a knowledge of the economics of his particular interest; he should have business as well as technical aptitude and he should appreciate the problems of costing and plant obsolescence. Further, he should know the pitfalls and opportunities of recent legislation, such as the Derating Act as applied to factories, and the principles generally of assessment and rating. Again, he should understand the psychological side of mechanised labour, be well founded in building regulations, factory Acts, public health, fire protection, and all the other requirements that were being increasingly imposed by Government and local authorities. Above all, he must realise the obligations which implicitly fell on all who lived by extending industries in an already over-crowded country.

Sir Alexander Gibb, president of the Institution of Civil Engineers and Engineer to the Commissioners for the Special Areas.

When one set out to put up a new works anywhere in this country, one found oneself hedged around with a vast number of restrictions which seemed exasperating. Apart from the many restrictions of Acts of Parliament and local by-laws, and the still rather uncertain administration of Town Planning and Ribbon Development Acts, there were grave difficulties in such matters as the disposal of trade effluents, trade waste, fumes and gases, the risks that were run of injunctions against noise and disturbance, and the ever-growing transport difficulties—to name only a few of the obstacles which had to be surmounted. Whilst agreeing that the remnant of such amenities as we still possessed must be safeguarded, Sir Alexander said that it appeared sometimes that the general attitude of both the powers that be, and the public at large, was that new industries should be prevented from being established at all. In the case of one very big works for which his firm was responsible, they were informed quite bluntly that the County Council would much prefer that the works were not set up in their area, and it was common experience to be told by public utility companies that they found it far more profitable to supply private houses and small users than big industries.

So far as he could see, no very clear views existed on the part of either Government or public, or indeed in industry and engineering, as to what principles should govern the establishment of new industries. At the present time there was not that liberty of action which existed in the days of our fathers and grandfathers, and the State was bound to play an increasingly important part in all matters affecting the administration of our congested life. Transport was already semi-nationalised, electrical distribution certainly was, and so also was factory rating. In addition, the problem of the Special Areas had supervened to force still further the hand of the Government which, all unwillingly, was becoming more and more a partner in private industrial activity. It would seem, therefore, essential that there should be a clear view as to what should be the principles governing modern industrialisation. It had been stated that a Royal Commission was to be appointed to study the problems connected with the location of industry, and it could only be hoped that this Commission would report with more than customary speed.

As an instance of the manner in which the burden in this matter was being placed upon the Government, either directly or indirectly, Sir Alexander referred to the conflict recently witnessed over the proposed manufacture of carbide in this country. The Government apparently found it quite impossible to reach any conclusions as to whether, in the first place, carbide should or should not be manufactured in this country; secondly, whether it could be so manufactured efficiently and economically; and thirdly, whether the Highlands or South Wales, Lanarkshire or Durham, were the proper location. In his view, however, it should not be considered satisfactory that a decision on a matter of such technical difficulty should have been left ultimately to the House of Commons. Primarily it was a chemical engineering problem, but that was not the line on which it was approached or disposed of.

The many new considerations arising in the industrialisation and re-industrialisation of this country, closely affected the chemical engineer, and Sir Alexander asked whether the Chemical Engineering Group or the Institution of Chemical Engineers had ever considered the question of industrial zoning. It would surprise him, he said, to learn that there were half-a-dozen members of the Chemical Engineering Group, who had ever taken any active part in the problem of town planning. Did a single member of the Group belong to the Town Planning Institute? It might be considered that all that belonged to the architects, economists and cranks, but he assured them they were wrong.

Turning to the question of trade waste and trade effluent and the emission of gases, noxious vapours and grits into the air, Sir Alexander said that the disastrous pollution of many streams and rivers had rightly challenged action on the part of Government and the authorities, and harmless means must be provided for the disposal of inevitable wastes and effluents. The solution of this problem lay quite as much with the chemical engineer as with the sanitary expert or the engineers of catchment areas and river boards.

There was no one so well placed to advise and help in many aspects of industrial planning and indeed, none whose duty it was more so to do, than the chemical engineer. But at the moment he was not, unfortunately, in a position to put forward his views, except to a very limited extent because he had not really troubled to acquaint himself with the broader problem. Therefore, he strongly recommended chemical engineers generally to rectify this position by directing attention to the problems which were looming up. The Group and the Institution of Chemical Engineers might profitably invite outside experts to read papers before them in order that they might acquaint themselves with what was being done and what was intended, with a view to the stimulation of criticism, and in order to produce valuable reactions from the chemical engineering point of view. There should also be a broader outlook in the curriculum of chemical engineering training

Special Copper Section

A REVIEW OF THE APPLICATION OF COPPER AND ITS ALLOYS IN CHEMICAL ENGINEERING PRACTICE

Foreword

By D. P. C. NEAVE (General Manager, Copper Development Association)

COPPER has always been used extensively where corrosion resistance is required, and its use for such purposes as water pipes, cooking utensils and vessels for mixing pharmaceutical preparations dates back several thousand years. As the chemical industry proper developed, so the uses of copper extended, and its use in the manufacture of plant for brewing, and for the distillation of spirits, alcohol and other solvents, and also plant for the evaporation of a large number of inorganic and organic solutions has long been established, while it is also the traditional metal for processing foodstuffs such as milk and preserves.

As to sources of supply, copper mines were worked in England for many centuries, and up to the middle of the last century England was the world centre of the copper smelting industry. After that time, however, the development of the very large ore deposits in America transferred the centre of the industry to that country, and until a few years ago the United Kingdom was very largely dependent upon foreign supplies of copper. Within the last few years the situation has very radically altered, owing to the development of copper deposits within the Empire, both in Rhodesia and Canada. The production of copper from these two countries is more than sufficient to supply the whole requirements of the United Kingdom even at the present record consumption figure of over 250,000 tons a year, and as the reserves of copper ore in both these countries are enormous there is no doubt that the demands of the home market can be satisfied from Empire sources for a very long time to come.

The post-war period of activity in metallurgical research naturally embraced the investigation of copper and its alloys, and the activities of the British Non-Ferrous Metals Research Association, since its formation soon after the war, have had a very considerable effect in extending our knowledge of the properties of these metals. It became evident, however, that some link was required to keep users of the metal abreast of the many technical advances which were being made in the applications of copper and its alloys, and therefore about four years ago the Copper Development Association was formed by the principal copper producers of the Empire, and leading copper manufacturers. The Association is a non-commercial organisation representing copper interests as a whole, and is at the service of industry to provide technical information on all subjects dealing with the utilisation of copper and its alloys.

Recent Developments in the Use of Copper Alloys for Chemical Plant

By STANLEY BAKER

COPPER has many properties which commend it as a material for the construction of chemical plant, the chief of these being its strength, its high thermal conductivity, its excellent corrosion resistance to a wide variety of substances, its high ductility, which enables it readily to be hot or cold worked, and its adaptability to a variety of jointing methods.

Until a few years ago all commercial coppers were of the tough pitch varieties and contained a small percentage of oxygen (up to 0.07 per cent.) which was necessary in order to make sound castings by reducing to a minimum the absorption of hydrogen from the furnace gases during refining. The oxygen exists as cuprous oxide, and for the majority of purposes is not objectionable, as it has only a negligible effect on the mechanical and electrical properties. It has, however, the disadvantage that when subjected to the action of reducing gases, in particular hydrogen, at elevated temperatures and particularly above 600°, the cuprous oxide is reduced with the formation and escape of steam, resulting in the weakening of the copper by embrittlement.

This disadvantage is particularly apparent in gas welding owing to the reducing gases present in the gas, and though this can be overcome by using an exactly neutral flame, yet without the exercise of great care and skill successful welds are difficult to make. A few years ago, however, a product known as deoxidised copper became available from which all the oxygen had been removed by the addition of some deoxidant, generally phosphorous, and though this type of copper requires skill in welding, yet the absence of cuprous oxide enables successful welds to be made which are to all intents and purposes indistinguishable in strength and appearance from the parent metal. This is of considerable importance in the chemical industry, as it enables plant to be made of completely homogeneous metal and thereby avoids the drawbacks of making joints by brazing or riveting, the former of which has certain objections in the presence of corrosive liquids owing to the possibility of preferential attack of the brazed seams and the latter owing to the difficulty of ensuring the complete absence of any crevices at the riveting which would serve as starting points for corrosion. Deoxidised copper has also a further advantage that it can undergo slightly more severe cold working than tough pitch varieties, and therefore is very suitable for operations such as flanging or flaring.

Any of the ordinary varieties of copper such as high conductivity, best select or arsenical copper may be obtained in the deoxidised condition. Deoxidised arsenical copper (usually containing up to 0.5 per cent. of arsenic) is very extensively used in the manufacture of chemical plant as the presence of this quantity of arsenic increases the strength of the copper at moderate temperatures and also raises by about 100° C. the temperature at which annealing commences. This property is of considerable advantage for plant which is in the work hardened condition, and is to be subjected to elevated temperatures. Small additions of other elements such as silver and nickel have an influence on the annealing tempera-

ture similar to that of arsenic and even 0.1 per cent. of silver will raise the annealing temperature by 100° C.

The great variety of copper alloys provides a wide choice of material for units where a greater strength is required, and for parts such as valves, pumps and fittings which have to be cast and machined.

The brasses, tin bronzes and gun metals have long been the principal alloys used for such purposes and small additions of other elements such as nickel, iron, aluminium, manganese, are frequently made to improve the mechanical properties. There have also been developed for special purposes a number of other alloys of which a few of the more important will be briefly discussed. A copper-rich brass or gilding metal of composition copper 85, zinc 15, is being increasingly used, particularly in America, for use in petroleum refineries and in water services where ordinary brass was found to be somewhat unsatisfactory. Such brass is not subject to de-zincification—a form of corrosion to which the normal brasses are liable.

Aluminium Bronzes

The aluminium bronzes—alloys of copper generally containing between 5 and 10 per cent. aluminium—have high strength and are available in either cast or wrought forms. They have high resistance to corrosion in the presence of certain substances, particularly sulphuric acid, due to the protective film of aluminium oxide which forms on the surface. These bronzes are also very resistant to the action of flue gases, and are therefore being increasingly used in the manufacture of plant which is to be subjected to direct heating such as the bottoms of varnish kettles. The resistant and self-healing skin of aluminium oxide is also responsible for the extensive use of aluminium brass of composition copper 76, zinc 22, aluminium 2 for marine condensers, as it is found that tubes of this material resist well the impingement attack caused by the high speed of flow of the sea water. A high degree of resistance to this form of attack is also shown by cupro-nickel tubes of composition 70 copper, 30 nickel.

Considerable interest has been shown in the modern copper silicon alloys in which the silicon is usually present in amounts of from 3 to 5 per cent., and frequently amounts not exceeding 1 per cent. of iron or nickel or manganese are also present. While these alloys have a strength practically double that of copper in the annealed state, they are amenable to the same methods of working as copper itself and have similar corrosion resistance. Under most conditions, though, they have somewhat greater resistance to sulphuric acid and are suitable for use with this acid in fair strength. They can be cast for valves and fittings or supplied in large sheets or tubes and they can be readily welded.

Welding of Copper Alloys

The welding of this class of copper alloy is simpler than is the case with copper, and either gas or electric welding can be adopted since the thermal conductivity is much lower and therefore there is not so much heat dissipated in the metal surrounding the weld, while at the same time the presence of the silicon in the copper acts as a deoxidiser and prevents unsoundness due to the formation of copper oxide in the weld area. Owing to their greater strength a much thinner material can be used in the construction of units than would be the case if copper itself were used, and therefore copper silicon alloys find application for such purposes as tanks, either for rail or road, or wherever a minimum weight is of importance. The best known of these alloys is probably Everdur, which is now being made in this country, while others are known as P.M.G. metal, Cusiloy, Duronze, Herculoy, Olympic bronze, Rotoxit.

One of the most striking of the alloys of copper is beryllium copper, which contains about 2.5 per cent. of beryllium. This alloy in comparison with copper has a very greatly increased strength and hardness, and it has the further advantage that by suitable heat treatment after fabrication it can be still further hardened. This heat treatment consists in heating the finished article to the temperature of about 270° for a predetermined length of time, and the hardness then becomes that of a high grade steel. The high price of beryllium has so far prevented the application of these alloys to any extent, but recently, owing to the improved methods of manufacture of beryllium itself the cost of these alloys has been markedly reduced and their use for non-sparking tools wherever an explosion hazard exists will doubtless increase. The corrosion resistance of these alloys is very high and there are therefore particularly suitable for the manufacture of springs and other parts in precision instruments where high fatigue and corrosion resistance are necessary.

Welding for Copper Plant

The Vertical Two Operator Technique

IN the construction of chemical plant, the strength of the oxy-acetylene welded joint as much as the saving in weight which its use effects, is becoming more and more appreciated by designers and constructors. The fact that unlike other types of joints the finished welded joint is almost undetectable, has likewise been greatly valued as a practical contribution to the contest with corrosion, since points of attack are reduced to a minimum.

As a jointing method, oxy-acetylene welding has been widely used by chemical plant engineers, sheet metal workers, coppersmiths, and others interested in the design and production of chemical plant from copper. Much careful research and experiment by the British Oxygen Co., Ltd., and the producers of copper sheet has resulted in the establishment of a procedure which, carefully followed by the conscientious welder, has rendered construction as near foolproof as possible.

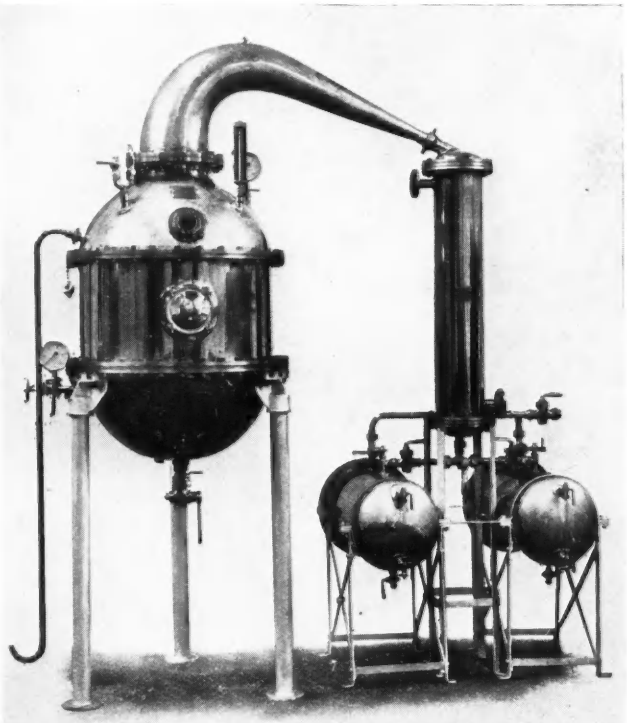
Deoxidised copper sheet, an alloy filler rod of suitable composition, plus a suitable flux conveniently applied, comprise the actual materials desired in the construction of copper chemical plant by oxy-acetylene welding. The method to be followed has already been clearly stated in textbooks on welding and in literature issued by the concerns mentioned. Recently, however, the British Oxygen Co. has directed attention to the advantages of employing the appropriate method for each job incorporating welding. In the manufacture of non-ferrous (particularly copper) tanks and vessels for chemical, brewery, food and dairy plant, for example, the Company's sales technical service are demonstrating, among other improved methods, the vertical two-operator welding technique. By this method, plate up to $\frac{5}{8}$ inch thick can be welded without bevelling, and in spite of the fact that two welders are employed working from both sides of the plate, time and money are saved. This is due to the increased welding speeds obtainable, the use of smaller blowpipes, and the decrease in the consumption of gases and rods as compared with the old methods.

Standard Ferro-Chromiums

Tests by Independent Chemists

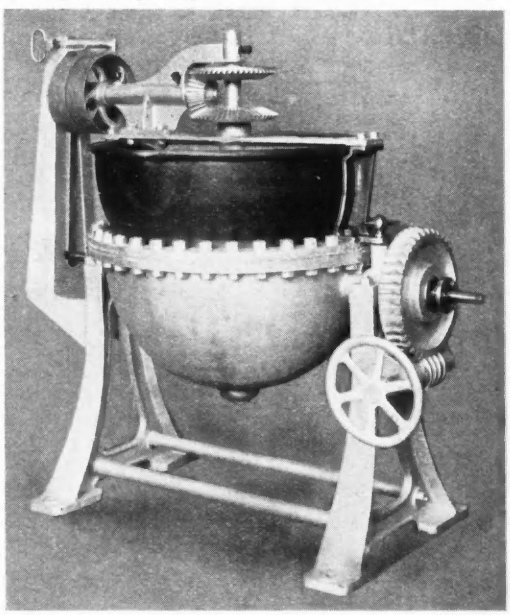
THE Bureau of Analysed Samples, Ltd., announces the issue of two new standard ferro-chromiums, in which the chromium, carbon, and sulphur has been standardised. As usual each sample has been analysed carefully by at least ten chemists representing independent laboratories, and buyers' and sellers' chemists in this country and elsewhere. The certificate which accompanies each bottle of the standard sample gives an interesting record of the methods of analysis used by each chemist. The orthodox sodium peroxide fusion method was used by the majority of chemists, but in several cases the new persulphate and perchloric acid methods, which have proved to be both quick and accurate, were used. Other interesting features were a new combusion method and a new perchloric acid method for sulphur.

Copper Plant for Chemical and Allied Uses shows much variety in design, purpose and finish. Here is a typical selection of such plant from British Manufacturers

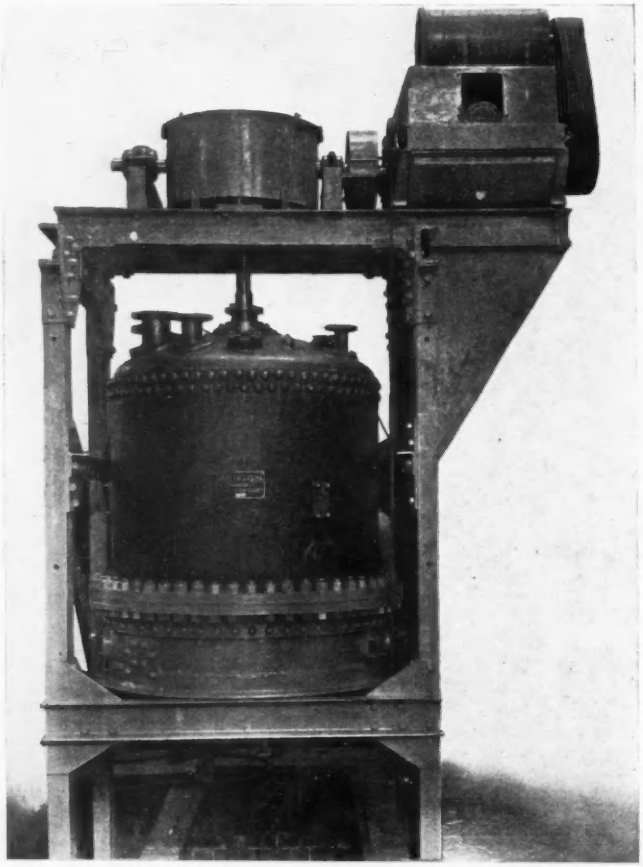


Here is an essence distillation plant with a capacity of 80 gallons. It is a typical example of the high degree of workmanship which can be incorporated in plant made of copper. The still is of the vacuum type, and has the bottom section steam jacketed. The distilled vapours pass through the copper swan neck, and are condensed in the water-cooled tubular condenser on the right. Facilities for storing and using the distillate without breaking the vacuum are provided in the form of two receivers supported at a convenient height from the ground. The entire plant is made of copper and gunmetal, and is heavily tinned throughout. (George Clark and Sons, Hull, Ltd.)

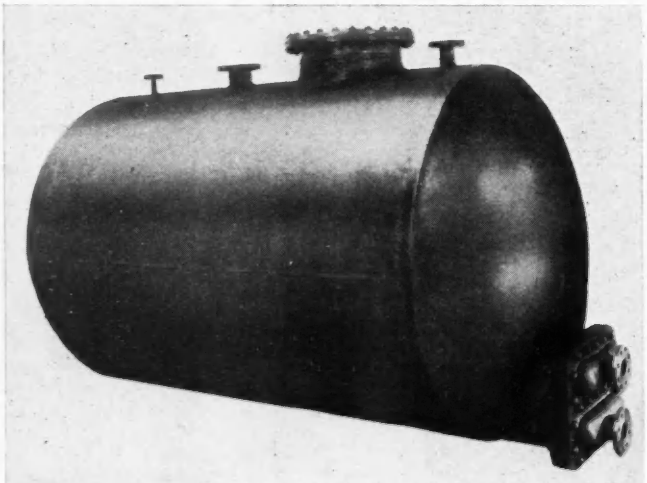
This mixing and decanting vessel is made of copper and is of novel design. It is 5 ft. 3 in. diameter by 10 ft. deep. Copper 5/16 in. thick has been used, with welded construction. There are motor-driven internal gunmetal stirrers operating through worm gearing at the top of the vessel. The top cover is made of mild steel $\frac{1}{2}$ in. thick. An internal steam coil provides a heating surface of 60 square feet, and there are five decanting outlets. Sight glasses, vacuum gauge, thermometers, steam inlet valves, drain water cocks, etc., are provided. (S. Briggs and Co., Ltd.)



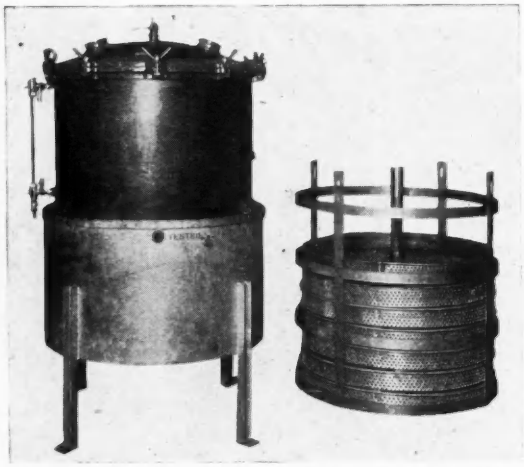
Copper mixing pans of standard type with cast iron steam jackets can be really sturdy and mechanically efficient in design. In this particular case the internal copper pan is surmounted by a copper belt piece. The bronze stirrers are driven by rigid bevel wheel gearing. There is a worm and worm wheel for tilting the pan. (S. Briggs and Co., Ltd.)



Steam jacketed copper stills are very efficient from the aspect of heat transfer. This still has a body 4ft. diameter and 6 ft. 3 in. deep, and is constructed of 9/16 in. copper, with dished ends $\frac{3}{4}$ in. thick, a riveted construction being adopted throughout. The steam jacket is made of mild steel $\frac{5}{8}$ in. thick, and is suitable for a working pressure of 100 lb. per square inch. There is a motor-driven internal gunmetal stirrer operated through bevel gearing. All the usual fittings, comprising steam inlet valves, drain cocks, air cocks, vacuum gauge, sight glasses, and manhole, are provided. (S. Briggs and Co., Ltd.)

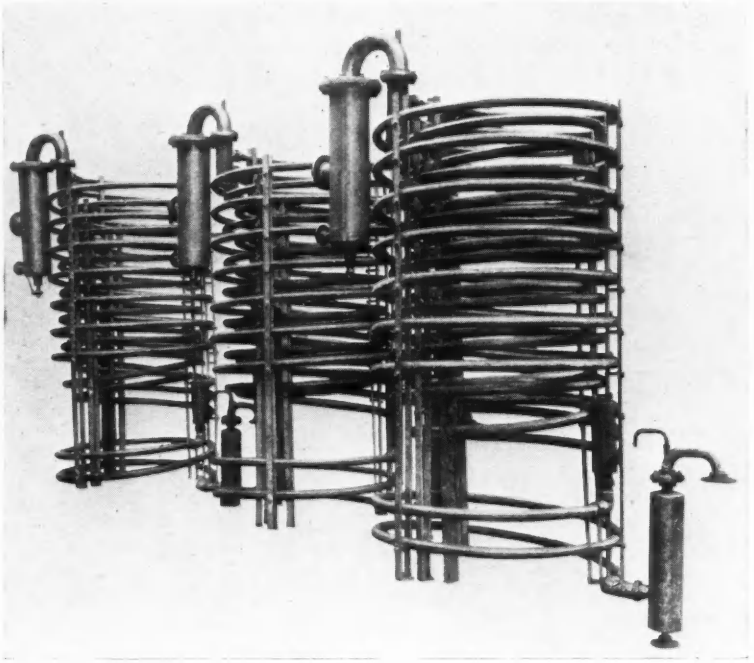


This chemical calorifier and storage tank is made of hard rolled copper sheet up to $\frac{1}{2}$ in. thick. The vessel is 5 ft. diameter by 9 ft. long. From the constructional aspect it has a unique feature in having all joints made by welding ; no brazing whatever is incorporated so that chemicals cannot come into contact with any metals other than copper. The heating element consists of solid drawn copper tubes expanded into the rectangular copper tube plate, but the steam header (out of contact with the chemicals) is made of cast iron. (George Clarke and Sons, Hull, Ltd.)

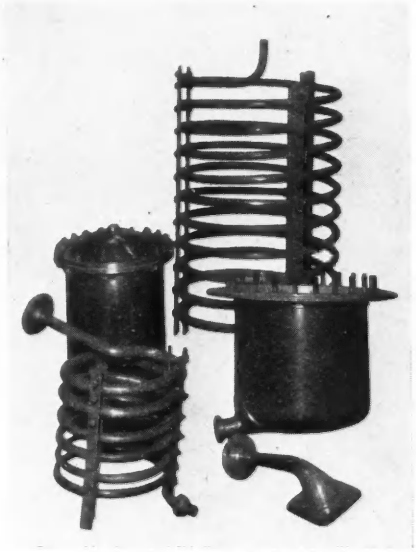


Designed as a fruit cooker, 3 ft. diameter by 4 ft. deep with dished bottom, hinged cover, eight swing bolts and wing nuts, and recessed rubber joint, this vessel is made of 9 s.w.g. copper, so that it can withstand high vacuum without collapse. It has an inside coating of pure tin. The body seams are welded and finished smooth and the gunmetal cover rings are riveted and sweated on. A nest of seven perforated copper trays, complete with copper supporting frame and central cone circulator, all coated with pure tin, fits inside the vessel. (Blundells and T. Albert Crompton and Co., Ltd).

Here is a copper still measuring 3 ft. diameter and 1 ft. 6 in. deep in the steam space, which is provided with a 9 in. domed top and swan neck. The cast iron jacket is suitable for 50 lb. steam working pressure. The capacity of the still to the top flange is 75 gallons. The dome is fitted with swing-bolt jointing rings and is easily removable. A supplementary internal steam coil is fitted for blowing steam direct into the contents, whilst the vessel can be tipped by the worm and quadrant tilting gear for the removal of residues and cleaning. (William Brierley, Collier and Hartley, Ltd.)

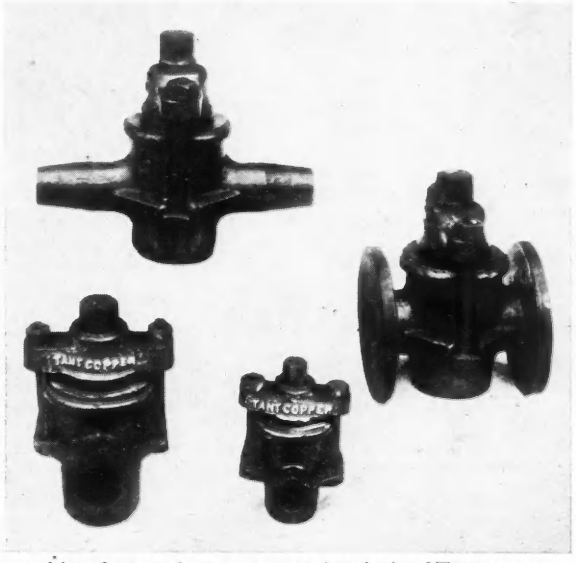


Here is a triple condensing coil comprising a total of 240 ft. of 2-in. diameter copper tubing. It is fitted with cast manifold inlet and outlet chambers and "anti-spit" made from copper sheet. Such a coil could not be constructed so economically in any metal other than copper. (William Brierley, Collier and Hartley, Ltd.)



A small welded copper fire-heated still body with brazed-on gunmetal flange and run-off pipe is here illustrated, together with a welded copper taper still-head pipe with gunmetal flanges brazed on, two solid drawn copper condenser coils, and a cylindrical welded copper receiver. (Blundells and T. Albert Crompton and Co., Ltd.)

Designed for recovering acetone of 99.85 per cent. purity from a 2 per cent. solution, this 8-ft. diameter distilling column (of which only a few intermediate sections are shown) is made of phosphorus deoxidised copper of special welding quality. The shell is 3/16 in. thick. As erected, there are about 25 of the intermediate sections and the total height of the column is just over 48 ft. (Aluminium Plant and Vessel Co., Ltd.)



Acid cocks are often constructed entirely of Tantcopper. This copper silicon alloy is resistant to the action of all inorganic and organic acids, except nitric acid, and is very suitable for the manufacture of fittings used at chemical works. Its conductivity for heat is approximately 10 per cent. less than that of pure copper. (Lennox Foundry Co., Ltd.)

Copper in the Construction of Chemical Plants

Points of Interest from a Chemical Engineer's Notebook

As a chemical plant material copper has one outstanding feature. Being extremely ductile and malleable it is adaptable to the construction of any desired shape—however intricate—without excessive increase in cost. Secondly, copper is one of the best constructional materials for plant where the transfer of heat is essential to the process, for instance, in distillation, condensing and cooling. Its main drawback to a much wider use by the chemical engineer is in respect of corrosion, although uses have been greatly extended by the introduction of alloys in which copper is the main constituent.

Distillation of Acetic Acid

In most corrosive chemical liquids, or aqueous solutions of chemicals, copper is slowly corroded in the presence of air or oxidising agents, due to their depolarising action and the ease with which soluble oxides of copper are formed. In consequence, copper can be used only for those chemical processes where such actions do not predominate, one of the most notable cases being found in modern equipment for the continuous distillation of acetic acid. Copper, indeed, is the premier metal of the acetic acid industry, and there are no present prospects of any other metal or alloy becoming more satisfactory or even favoured, in spite of the fact that aluminium is highly satisfactory in contact with strong acetic acid, that nickel and monel metal have their own applications, and that chemical stoneware and high silicon irons are admirable from the viewpoint of entire freedom from corrosion.

In the case of acetic acid below a concentration of 56 per cent., copper is used exclusively for the construction of stills, condensers and cooling coils, pipework, and storage vessels, and especially in the case of storage vessels for crude acetic acid; pumps, working in connection with continuous distillation plant, are made of bronze on account of the need for a harder material to withstand mechanical wear. Glacial acetic acid can be distilled and condensed in copper equipment, conveyed by copper pipes, and used in copper reaction vessels. Acetic anhydride, closely related to acetic acid, also makes good use of copper equipment. This product, even with 15 per cent. of acetic acid which is the standard strength, can be handled in iron vessels without serious corrosion, but for condensers and pipework conveying crude acetic anhydride copper is preferable to iron, or even aluminium, which is mainly used in the final purification, storage and transport of the water-white product.

Control of Corrosion

The corrosion of copper by acetic acid is accelerated to a marked degree by the presence of air, and the useful life of leaky equipment is considerably shortened. This corrosion, however, can be controlled to a remarkable degree by the technique of operating acetic acid plant. For instance, equipment used in a continuous process of distillation will last much longer than it would in intermittent operation. "Hand hammering" is also important as a finishing operation for copper equipment. At one time it was almost a universal practice of the coppersmith, but present-day ideas in cutting production costs regard "hand hammering" as so much unessential expense, whereas the experience of large users of copper equipment in the acetic acid industry is to the effect that "hours spent in proper hammering give months of added service." It has also been found that annealed spots, where connections are brazed on without proper re-hammering, are more rapidly attacked than is the surrounding metal. Where "soft spots" cannot be reached with a hammer, possible corrosion may be retarded by a liberal coating of silver solder which extends well over the boundary line of soft and hard metal.

Copper is also satisfactory for handling other fatty acids, *i.e.*, propionic, butyric, etc., with the same condition which applies in the case of acetic acid, namely, absence of air. It has also been used in contact with gallic, tannic, lactic, oxalic and salicylic acids, although in the case of edible lactic acid it becomes necessary to use enamelled steel. Tannic acid is quickly discoloured by contact with iron or steel, due to the formation of iron tannates; even in minute quantities the resulting discolouration can be serious. Copper, however, and copper alloys in particular, do not form dark coloured compounds with tannic acid. For this reason copper is used exclusively for pressure extractors and vacuum evaporators. Other interesting applications occur in the case of turpentine, wood oils and resin. The vapours obtained in steaming wood chips for the extraction of turpentine, or to remove petroleum solvent after solvent extraction, are extremely corrosive to iron and steel by reason of the acetic acid which is present, and which becomes especially active at the point of condensation. Here stainless steel has been adopted with a certain amount of success, but copper has been found far more serviceable in the construction of vapour pipes and also condensers.

Fermentation and Alcohol Industries

Pure copper has very little competition as a material for the construction of equipment used in the fermentation and alcohol industry. It is here that the ease with which it can be fabricated into complicated shapes and pipe assemblies, together with its remarkably good heat conductivity, gives it advantages over all other metals and alloys. Some distilleries are still using copper fermentation vessels which were installed over 60 years ago. Stills, heaters and pipework which receive liquor from the fermentation vessels, are invariably made of copper. Evaporators and other processing equipment for the waste coming from the stills are also made of copper, which experience of long duration has proved to be wholly satisfactory. Steel pipe used as sewers for the hot waste from the stills have lasted about one year, whereas 14 B.W.G. copper pipes have served eight years before there was any need for replacement. In the wood alcohol industry, copper, bronze and brass are the materials used universally for most of the equipment. Steel pipes and shipping drums are the only departures from the copper and copper alloy rule.

Copper stills, condensers, cooling coils, pipework, storage and reaction vessels are satisfactory wherever amyl, benzyl, ethyl, isoamyl, isobutyl, methyl, propyl and isopropyl alcohols are being handled; also in the case of glycerol and ethylene glycol. Indeed, it so happens that copper finds a very much wider use in contact with organic chemicals than it does in contact with inorganic chemicals. Copper stills, storage vessels and reaction vessels are used for formaldehyde; copper stills for chloroform and ethers; copper concentrators and storage vessels for gelatine solutions; copper concentrators, pipework and storage vessels for glucose. In the form of bronze and other copper alloys there are many other uses which might not be suspected. Although steel plate evaporators with steel tubes may be generally used for concentrating Twitchell sweet waters in glycerine extraction at soap works, cast iron evaporators provided with copper tubes have been found to have a much longer life.

In the cellulose acetate industry, copper pipes are used to handle all exit materials, as copper withstands the action of the weak acid better than does aluminium. Copper is also the material usually employed in the construction of acetylators; it is satisfactory from the aspect of strength and also resistance to corrosion, but finds a serious rival in 18-8 chrome nickel steel and nickel-clad steel. In the varnish making industry copper is widely used in preference to iron, as the

hot linseed oil is not serious in the case of iron kettles, but colour of the finished product is never quite as good as when made in iron equipment. The actual corrosive action of the the colour of the resulting varnish may be seriously affected from the selling aspect.

Copper is rarely recommended for use in the case of inorganic acids, salts and alkalies. Solutions containing ammonia dissolve the metal readily, especially in the presence of air, but it is attacked only slowly by sea-water and weak brines and here finds useful applications in the construction of pipework and pumps. Copper has also been used in the construction of digestors where dilute sulphuric acid is employed; for the tubes of evaporators working up ammonium sulphate liquors; for pipework and storage vessels handling copper sulphate solution; for pipes conveying sodium dichromate and also zinc chloride; and for evaporator tubes in concentrating caustic soda and caustic potash liquors.

There are over two thousand alloys of copper containing zinc, tin, aluminium, nickel, silicon, iron, phosphorus, and other alloying elements, singly or in association. Although many of these alloys are useless in the chemical industry, others are found to be particularly serviceable for handling some of the common corrosive liquids and solutions. Everdur, a copper alloy containing 3 per cent. of silicon and 1 per cent. of manganese, is used in the United States with great satisfaction for digestors engaged in the recovery of furfural from oat hulls. In most cases the alloys possess better physical properties than does the unalloyed metal, but they are not all so easily fabricated. Hot water for washing the finished sugar at refineries is stored in copper tanks and conveyed by copper pipes. Vacuum pans and their interconnected pipes are usually made of copper, but the heavy filtered liquors are stored in steel tanks. " Sweet water " at sugar refineries will destroy a steel pipe much more rapidly than a copper pipe.

Copper Piping in the Gas Industry

Advantages over Other Metals

THE merits of copper for service pipes and carcassing compared with those of lead and iron were discussed at a recent meeting of the London and Southern District Junior Gas Association. Mr. J. H. Gibbons (Croydon), who opened the case in favour of lead and iron, contended that an objection to the use of copper pipe was its cost.

Mr. S. F. DUNKLEY (Gas Light and Coke Co.) took the other view and drew attention to the advantages of copper over wrought iron, mild steel and lead. Why was there this heavy and growing demand for copper in all industries? To him it was easy to see. Copper in particular, together with many of its alloys, had the necessary essential of cheapness combined with the ideal chemical, physical and mechanical properties. Its thermal conductivity was second only to silver and about seven times as great as iron and steel, making its use desirable for water heaters, calorifiers and the like. It was in its annealed condition a particularly soft metal, enabling it to be severely bent or deformed without damage. This high degree of ductility and malleability enabled it to be hardened to any desired degree by cold working.

Copper's high resistance to corrosion was exemplified by the numerous antiques which have survived thousands of years and which are still in an excellent state of preservation. The roofs of many old public buildings also gave ample proof of this. Copper was, as Mr. Dunkley termed it, self-protective; a very thin and adhesive oxide film which forms rapidly being sufficient to protect it against further attacks. Lead—one of the other metals they were considering—had this property to a much lesser degree as well as many other disadvantages. Copper was a particularly easy metal to solder and braze or weld—a most important point in any engineering process. Of all the commercial metals, copper was ideal as a base for the electro-deposition of metals, including nickel and chromium,

The combined good properties of copper, emphasised Mr. Dunkley, enabled it—in spite of its higher initial cost—to be used with advantage over and at a lower cost than many of its competitors. Its greatly increased strength and rigidity as a result of cold working, combined with its high resistance to corrosion, permitted of much lighter gauge metal being used than was possible with alternative metals.

Mr. Dunkley went on to refer to the various methods of jointing which could be applied to copper tubing—the die-cut threaded joint, which was only suitable for heavy gauge tubing; brazed and welded joints, which did not show any saving in labour or material, and were more suitable for very large diameter pipes; compression joints, the original type of joint that made possible the use of light gauge copper tube, but the previous lack of standardisation of outside diameter as well as poor appearance and high cost had prevented its more general adoption, as well as the tendency to draw through expansion, contraction and vibration; capillary soldered joint, which was rapidly growing in poplarity by reason of its extreme neatness and cheapness, while, with ordinary care in making, the joint was stronger than the tube; and finally, the rolled thread joint, which was a promising joint used in Germany.

Coronation Items

The directors of the Energen Foods Co., Ltd., are granting their works and office staff a week's holiday with full pay on the occasion of the Coronation.

A party of New Zealanders who are here for the Coronation were conducted round the Beeston factory of Boots Pure Drug Co., Ltd., at Nottingham, on April 28.

The Institute of Chemistry has made a special appeal on behalf of its benevolent fund in celebration of Coronation Year. The King is patron of the Institute.

The employees of Cadbury Brothers, Ltd., Bournville, in addition to being given a day's holiday with pay on Coronation Day, will receive three extra days' pay.

Johnson, Matthey and Co., Ltd., inform us that though they are not celebrating the Coronation particularly in their reconstruction scheme, they have on foot plans for the demolition of their existing head offices in Hatton Garden and their replacement by a modern suite of offices. The execution of these plans will take a number of years owing to the gradual displacement of plant and machinery involved.

A benevolent fund is to be inaugurated by the Stanton Ironworks Co., Ltd., on Coronation Day. The company promises to pay £2,000 annually for five years at least, and there is a guarantee of £350 interest. The latter sum will be available immediately after the Coronation for present use. Persons eligible are retired and present employees and their wives and families. In all about 14,000 employees of the firm will benefit.

As far as practicable all employees of Imperial Chemical Industries, Ltd., will receive a day's holiday on Wednesday. Under the company's existing agreements with the trade unions this day will be paid for at normal rates to those not working, while those who are required to work will be paid overtime at the agreed rates. In addition the company will present a gift of 10s. to every employee (staff and workers) who is on the pay roll of its various offices and factories throughout the United Kingdom on May 12.

The Chemical Age Lawn Tennis Tournament

Draw and Guide to Competitors

THE draw for the seventh annual Chemical Age Lawn Tennis Tournament was made on Tuesday, and full particulars, together with an alphabetical guide to the competitors, are given in this and following pages. Except in the case of the finals, players drawn against each other must make their own arrangements for playing off the match on a court mutually agreed upon. In the event of disagreement the first name drawn has the right to choose the ground. The best of three advantage sets will be played in each round.

It is important that competitors should bear in mind the closing dates for the various rounds as shown at the head of each of the two draws. Results must be sent to the Editor of THE CHEMICAL AGE immediately after the match, and must in any case reach him not later than first post on the day following the final day for playing off the round.

Whilst there will be no new draw for each successive round, a draw will be made for the right of choice of ground and competitors will be notified accordingly.

Alphabetical List of Players

The following alphabetical list indicates names of all competitors in The Chemical Age Lawn Tennis Tournament. Addresses and telephone numbers are given to facilitate communication between players.

Allen, F. R. O. (Nobel Finishes, Ltd., Slough, Bucks. 'Phone: Slough 528; ext. 55).

Barnes, S. (British Oxygen Co., Ltd., Angel Road, Upper Edmonton, N.18. 'Phone: Tottenham 2488).

Baxter, A. (United Yeast Co., Ltd., 238, City Road, E.C.1. 'Phone: Clerkenwell 0303).

Bennett, R. A. J. (Nobel Chemical Finishes, Ltd., Slough, Bucks. 'Phone: Slough 528; ext. 55).

Blow, D. G. (British Drug Houses, Ltd., 18-30, Graham Street, City Road, N.1. 'Phone: Clerkenwell 3000).

Bowden, E. F. (Le Grand, Sutcliff, and Gell, Ltd., The Green, Southall, Middx. 'Phone: Southall 2211).

Bowler, H. (Nobles and Hoare, Ltd., Cornwall Road, S.E.1. 'Phone: Waterloo 4694).

Brewer, G. (Corn Products Co., Ltd., Bush House, Aldwych, W.C.2. 'Phone: Temple Bar 2091).

Britnell, E. (County of London Elec. Supply Co., Ltd., Generating Station, Creeks Mouth, Barking. 'Phone: Rippleway 2461).

Burnham, C. J. (C. J. Hewlett and Sons, Ltd., 35, Charlotte Street, E.C.2. 'Phone: Bishopsgate 1172).

Chaloner, S. E. (Monsanto Chemicals, Ltd., Ruabon, Denbighshire. 'Phone: Ruabon 3).

Champkin, R. A. (B. Laporte, Ltd., Kingsway, Luton, Beds. 'Phone: Luton 891).

Copp, C. G. (Doulton and Co., Ltd., High Street, Lambeth, S.E.1. 'Phone: Reliance 1241).

Cornelius, L. (Stafford, Allen and Sons, Ltd., 7, Cowper Street, Finsbury, E.C.2. 'Phone: Cle 2100).

Cosgrove, A. (Hanovia, Ltd., Bath Road, Cippenham, Slough. 'Phone: Burnham 500).

Crosse, F. G. (Society of Chemical Industry, 46-7, Finsbury Square, E.C.2. 'Phone: Met 3773).

Darton, F. (J. Buchanan and Co., Ltd., 26, Holborn, E.C.1. 'Phone: Holborn 6183).

Eager, J. (Griffiths Bros. and Co., Ltd., Macks Road, Bermondsey, S.E.16. 'Phone: Bermondsey 1151).

Eastwell, J. S. (British Xylonite Co., Ltd., Hale End, London. 'Phone: Larkswood 2345).

Eyres, A. F. (Johnson Matthey and Co., Ltd., Hatton Garden, E.C.1, 'Phone: Hol 6989; ext. 49).

Giltrow, L. (Williams (Hounslow), Ltd., Hamworth Road, Hounslow. 'Phone: Hounslow 1166).

Goudie, A. W. A. (Corn Products Co., Ltd., Bush House, Aldwych, W.C.2. 'Phone: Temple Bar 2091).

Gough, C. G. (Lever Bros., Ltd., C.T.D/G. Dept., Port Sunlight, Cheshire. 'Phone: Rock Ferry 500; ext. 110).

Grape, L. F. (Borax Consolidated, Ltd., Regis House, King William Street, E.C.4. 'Phone: Mansion House 8331).

Hammond, G. (Williams (Hounslow), Ltd., Hounslow, Middx.

Hancock, E. T. (Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, Walthamstow, E.17. 'Phone: Larkswood 2284).

Hand, F. D. (B. Laporte, Ltd., Kingsway, Luton, Beds. 'Phone: Luton 891).

Hann, J. S. (Griffiths Bros. and Co., Ltd., Macks Road, Bermondsey, S.E.16. 'Phone: Bermondsey 1151; Private: Buckhurst 0030).

Hanson, G. A. (Whiffens and Sons, Ltd., Carnwath Road, Fulham, S.W.6. 'Phone: Fulham 0037).

Hardee, J. E. (W. J. Bush and Co., Ltd., Ash Grove, Hackney, E.8. 'Phone: Clissold 0461).

Hawkes, K. W. (George Scott and Son, Ltd., Artillery House, Artillery Row, S.W.1. 'Phone: Vic 8708).

Hayman, R. D. (Doulton and Co., Ltd., 120, Granville Street, Birmingham. 'Phone: Mid 1315).

Healey, P. E. (Chemicovens, Ltd., Kintry House, Queen Street Place, E.C.4. 'Phone: Cen 3381).

Herridge, W. H. (British Xylonite Co., Ltd., Hale End, London. 'Phone: Larkswood 2345).

Hole, G. W. (Anglo-Samon Pet. Co., Ltd., St. Helen's Court, Leadenhall Street, E.C.3. 'Phone: Avenue 4321; ext. 107).

Hoppe, W. (Johnson Matthey and Co., Ltd., Hatton Garden, E.C.1. 'Phone: Hol 6989; ext. 49).

Hornsby, R. H. (Howards and Sons, Ltd., Uphall Works, Ilford, Essex. 'Phone: Ilford 3333).

Hudson, J. (Bakelite, Ltd., 68, Victoria Street, S.W.1. 'Phone: Vic 5511).

Hughes, A. E. (Limmer and Trinidad Lake, Asphalt Co., Ltd., Steel House, Tothill Street, S.W.1. 'Phone: Whitehall 6706).

Jones, J. I. T. (The Mond Nickel Co., Ltd., Thames House, Millbank, S.W.1. 'Phone: Vic 5353).

Killick, A. A. (B. Laporte, Ltd., Kingsway, Luton, Beds. 'Phone: Luton 891).

Lacy, E. D. (Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, E.17. 'Phone: Larkswood 2284).

Law, R. S. (Howards and Sons, Ltd., Uphall Works, Ilford, Nr. London. 'Phone: Ilford 3333).

Lewis, W. R. (British Oxygen Co., Ltd., Angel Road, Upper Edmonton, N.13. 'Phone: Tottenham 2488).

Liston, R. E. (Walter Carson and Sons, Ltd., Grove Works, Lombard Road, Battersea. 'Phone: Battersea 2451; ext. 31).

Lusty, H. H. (Bakelite, Ltd., 68, Victoria Street, S.W.1. 'Phone: Vic 5511).

Marcar, A. S. (Bovril, Ltd., 152, Old Street, E.C. 'Phone: Clerkenwell 2202).

Marchant, W. (Doulton and Co., Ltd., 120, Granville Street, Birmingham. 'Phone: Mid 1315).

Maronge, L. A. (Bakelite, Ltd., 68, Victoria Street, S.W.1. 'Phone: Vic 5511).

Mayers, W. P. (British Drug Houses, Ltd., 16-30, Graham Street, City Road, N.1. 'Phone: Clerkenwell 3000—Export Dept.).

Oakley, W. (W. J. Bush and Co., Ltd., Ash Grove, E.8. 'Phone: Clissold 0461).

O'Brien, P. D. (B. Laporte, Ltd., Kingsway, Luton, Beds. 'Phone: Luton 891).

O'Connor, F. (Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, E.17. 'Phone: Larkswood 2284).

Pavitt, E. (Co-Operative Wholesale Society, Ltd., Drug Works, Greenside Lane, Droylseden, Manchester. 'Phone: Droylseden 1348).

Plant, J. H. G. (Gas Light and Coke Co., Kings Road, Fulham, S.W.6. 'Phone: Fulham 5531).

Porter, R. F. (Howards and Sons, Ltd., Uphall Works, Ilford, Essex. 'Phone: Ilford 3333).

Pugh, G. (British Oxygen Co., Ltd., Angel Road, Edmonton, N.18, 'Phone: Tottenham 2488).

Prosser, V. (John Haig and Co., Ltd., Kinnaird House, 2, Pall Mall E., S.W.1. 'Phone: Whitehall 1040).

Rolfe, G. L. (Brandhurst, Co., Ltd., Vintry House, Queen Street Place, E.C.4. 'Phone: Cen 1411).

Rowley, E. (British Oxygen Co., Ltd., Angel Road, Edmonton, N.18. 'Phone: Tottenham 2488).

Scott-Bloxam, T. C. (Le Grand, Sutcliff and Gell, Ltd., The Green, Southall. 'Phone: Southall 2211).

Sleap, R. J. (United Yeast Co., Ltd., 238-240, City Road, E.C.1. 'Phone: Clerkehwell 0303; ext. 3).

Smith, C. G. (Shell Mex House, Victoria Embankment, W.C.2. 'Phone: Temple Bar 1234; ext. 311).

Smith, E. (Riley Harbord and Law, Parliament Buildings, Orchard Street, S.W.1. 'Phone: Abbey 3104).

Speakman, W. (Monsanto Chemicals, Ltd., Ruabon, Denbighshire. 'Phone: Ruabon 3).

Thedford, C. (Monsanto Chemicals, Ruabon, Denbighshire. 'Phone: Ruabon 3).
Tickner, A. H. (British Celanese, Ltd., 22, Hanover Square, W.1. 'Phone: Mayfair 8000; ext. 259).
Thompson, V. D. (Stafford, Allen and Sons, Ltd., 7, Cowper Street, E.C.2. 'Phone: Clerkenwell 2100; ext. 3).
Thomsett, E. A. (British Oxygen Co., Ltd., Angel Road, N.18. 'Phone: Tottenham 2488).
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Triggs, R. E. (Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, Walthamstow, E.17. 'Phone: Larkswood 2284).
Truslove, A. J. (Johnson Matthey and Co., Ltd., Hatton Garden, E.C.1. 'Phone: Hol 6989; ext. 16).
Tunstall, P. A. (Salt Union, Ltd., 20, Water Street, Liverpool, 2. 'Phone: Central 4370).
Turner, J. H. W. (Griffiths Bros. and Co., Ltd., Macks Road, Bermondsey, S.E.16. 'Phone: Bermondsey 1151).
Wakeman, W. E. (Johnson Matthey and Co., Ltd., Hatton Garden, E.C.1. 'Phone: Holborn 6989).
Walker, J. E. (National Farmers' Union, 48, Bedford Square, W.C.1. 'Phone: Mus 7526).
White, A. W. (Howards and Sons, Ltd., Uphall Works, Ilford, Essex. 'Phone: Ilford 3333).
Whittaker, E. (A. C. Wells & Co., Ltd., Carnarvon Street, Cheetham, Manchester, 3. 'Phone: Blackfriars 8044; Cheetham Hill 1886, Private).
Williams, H. (W. J. Bush & Co., Ltd., Ash Grove, E.8. 'Phone: Clissold 0461).
Williams, I. (Monsanto Chemicals, Ltd., Ruabon, Denbighshire. 'Phone: Ruabon 3).
Williams, R. M. O. (Imperial Chemical Industries, Ltd., Thames House, Milbank, S.W.1. 'Phone: Victoria 3828).
Williams, T. P. (Lever Bros., Ltd., Port Sunlight, Wirral, Cheshire. 'Phone: Rockferry 500; Extension 110).
Willshere, A. E. C. (Borax Consolidated, Ltd., Regis House, King William Street, E.C.4. 'Phone: Mansion House 8331).
Wilson, J. S. (British Celanese, Ltd., 22, Hanover Square, W.1. 'Phone: Mayfair 8000; Extension 260).
Woollard, J. K. (Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, Walthamstow, E.17. 'Phone: Larkswood 2284).

The Chemical Age Lawn Tennis Tournament

The Draw—Men's Doubles

Players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement the first drawn shall have the right to choose the ground. The asterisk (*) indicates the first name drawn in the initial stage. Best of three advantage sets.

First Round **Results to be notified by May 31**	Second Round *Results by* June 21	Third Round *Results by* July 12	Semi-Final *Results by* August 16	Final September 4
*T. P. Williams and C. G. Gough R. D. Hayman and W. Marchant				
*S. E. Chaloner and W. Speakman C. Thedford and I. Williams				
*R. E. Triggs and R. Tinkler V. Prosser and A. Baxter				
*J. I. T. Jones and R. M. O. Williams W. R. Lewis and S. Barnes				
*E. T. Hancock and J. K. Woollard W. H. Herridge and J. S. Eastwell				
*J. H. W. Turner and J. Eager R. F. Porter and R. S. Law				
*E. Dacre Lacy and F. O'Connor A. E. C. Willshere and L. F. Grape				
*L. Giltrow and H. Bowler L. A. Maronge and J. Hudson				
*A. W. A. Goudie and G. Brewer P. E. Healey and G. L. Rolfe				
*F. C. Crosse and J. E. Walker A. F. Eyres and W. Hoppe				
*R. A. J. Bennett and F. R. O. Allen F. D. Hand and P. D. O'Brien				
*G. W. Hole and C. G. Smith C. G. Copp and E. Smith				
*R. A. Champkin and A. A. Killick V. D. Thompson and L. Cornelius				
*A. J. Truslove and W. E. J. Wakeman J. S. Wilson and A. Tickner				
*R. Sleap and F. Darton C. J. Burnham and D. G. Blow				
*A. W. White and R. Hornsby W. A. Robbins and E. Bowden				

The Chemical Age Lawn Tennis Tournament

Men's Singles

Players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement the first name drawn shall have the right to choose the ground. The asterisk (*) indicates the first name drawn in the first round only. Best of three advantage sets.

First Round **Results to be notified by May 31.**	Second Round *Results by* June 21	Third Round *Results by* July 12	Fourth Round *Results by* August 2	Semi-Final *Results by* August 23	Final September 4
*C. Thedford	..... bye				
E. Pavitt	..... bye				
*T. P. Williams					
S. E. Chaloner					
*E. Whittaker					
C. C. Gough					
*R. D. Hayman					
I. Williams					
*W. Speakman					
P. A. Tunstall					
*W. P. Mayers					
R. E. Liston					
*A. J. Truslove					
J. I. T. Jones					
*P. D. O'Brien					
F. G. Crosse					
*J. S. Hann					
A. S. Marcar					
*R. S. Law					
D. G. Blow					
*A. A. Killick					
R. M. O. Williams					
*T. C. Scott-Bloxam					
G. Hammond					
*W. E. Wakeman					
R. J. Sleap					
*A. Baxter					
E. Britnell					
*R. F. Porter					
G. A. Hanson					
*H. H. Lusty					
A. W. A. Goudie					
*J. E. Hardee					
P. E. Healey					
*K. W. Hawkes					
J. H. G. Plant					
*R. A. G. Bennett					
L. A. Maronge					
*L. F. Grape					
G. L. Rolfe					
*A. E. Hughes					
J. E. Walker					
*H. Bowler					
V. D. Thompson					
*C. G. Copp					
J. S. Wilson					
*L. Cornelius					
E. Dacre Lacy					
*J. H. W. Turner					
H. Williams					
*W. Oakley					
A. H. Tickner					
*F. Darton					
E. A. Thomsett					
*F. D. Hand					
G. Pugh					
*A. Cosgrove					
E. Rowley					
L. Giltrow	..... bye				
W. R. Lewis	..... bye				

The Chemical Engineering Group

Annual General Meeting and Dinner

THE annual meeting and dinner of the Chemical Engineering Group of the Society of Chemical Industry was held at the Waldorf Hotel, London, on April 30. Mr. Stanley Robson, chairman of the Group, presided at both functions.

Mr. J. M. LEONARD, hon. secretary, reported on the activities of the Group during the past year, and the committee expressed the hope that the members would do all in their power to increase the membership. The accounts showed a small deficit for the year.

The following officers were elected:—Chairman, Mr. Stanley Robson; hon. secretary, Mr. Julian M. Leonard; hon. treasurer, Mr. F. A. Greene; committee, Dr. Stanley Baker, Mr. A. Sanders, Mr. S. J. Tungay and Mr. I. E. Weber.

A Healthy State of Affairs.

The CHAIRMAN expressed appreciation of the help he had received from the members of the committee and the hon. secretary and hon. treasurer, and said that with the considerable widening of the activities of the Group during the past year, he had found that assistance of the greatest possible value.

Expressing satisfaction at the good attendances during the session, he said that although in one respect it was a matter for regret, it was also pleasing that at most of the meetings more members desired to speak in the discussions than time permitted, which was a healthy state of affairs, and at the same time a tribute to the papers committee, and those who had assisted in selecting the subjects for discussion.

There were some 90 members and guests at the annual dinner which followed, the principal guest being Sir Alexander Gibb, whose address on "The Chemical Engineer and Industrial Planning" is reported in page 412.

After Sir Alexander's address Mr. WILLIAM RUSSELL proposed "The Society of Chemical Industry" and coupled with it the name of Lord Leverhulme, president of the Society of Chemical Industry.

The Late Mr. G. Gray

Lord LEVERHULME, responding, first referred with regret to the death, a few days previously, of Mr. George Gray, a former chairman of the Group, whose loss he said he mourned not only as a colleague on the council of the Society but as a personal friend. Mr. George Gray's father, the late John Gray, was a former president of the Society, and his name was perpetuated in the "John Gray Scholarship" which he bequeathed to the Society. The late Mr. George Gray, continued Lord Leverhulme, was a genial companion, and a warm hearted friend as well as a valued and able colleague on the council, and the profound sympathy of everybody went out to Mrs. Gray and her daughter. Speaking to the toast, Lord Leverhulme said the Chemical Engineering Group was the eldest child of the Society. He congratulated the Group on the work it had done since it was formed, and said he looked forward to meeting the members again at Harrogate in the summer, when the Society held its annual meeting.

Mr. W. A. S. CALDER proposed "Our Guests," and after referring to the high standing in the engineering profession of Sir Alexander Gibb, said that it was a matter of great pleasure to everybody to know that the Institution of Chemical Engineers had conferred upon Lord Leverhulme its highest honour in awarding him the Institution Medal for his eminent services to chemical industry during the past year. To all the other guests Mr. Calder extended the heartiest possible welcome and coupled with the toast the name of Mr. E. Wallace, chairman of the Association of British Chemical Manufacturers.

Mr. E. WALLACE said that although he would not discuss the question "What is a chemical engineer" he always felt, being neither a chemist nor an engineer nor anything else, that the term "chemical engineer" was put the wrong way round because he thought chemical engineers were those who engineered chemistry to suit themselves. Speaking seriously, he said that he would prefer to lay less emphasis on chemistry and more on engineering, because whilst a chemist might propound a theory it was the engineer who had to work it out.

Mr. H. W. CREMER proposed the toast of "The Chairman," and after congratulating Mr. Robson on the successful work he had done as chairman of the Group for the past two years, said it was a great satisfaction to know that he had agreed to continue as chairman for another year, adding that the Group was going from strength to strength under the chairman's care.

The CHAIRMAN, expressing his appreciation of the manner in which the toast had been received, said that whatever the Group had been able to achieve during the past two years, it would have not been possible but for the loyal support of all the members of the council and its honorary officers.

Bed-Bug Disinfestation

New Uses for Heavy Coal Tar Naphtha

PROMISING results have been obtained using heavy coal tar naphtha for the disinfestation of houses troubled with the bed-bug, according to an article in the British Medical Journal of February 27. The vapour given off by heavy coal tar naphtha is lethal to the bed-bug, and under suitable conditions easily penetrates to its harbourages such as cracks behind skirting boards, picture rails, and other places not reached by contact insecticides. The rooms are first made gas-tight and the walls and ceilings sprayed with naphtha on the basis of one gallon for each 750 cu. ft. of room space, gas masks with a suitable filter being worn during the process. To maintain a lethal concentration of vapour it is advisable that rooms be previously warmed to a temperature of 60° F. before fumigation and owing to the inflammable nature of the naphtha, naked lights or sources of heat must be extinguished. Experiments have indicated also that after a house has been warmed it is advisable in most instances to spray the roof space before the rooms are treated. No disturbance of woodwork or other fixtures is necessary and in general paintwork is not affected.

The rooms are kept sealed for 18 to 24 hours, and at the end of this time are ventilated by opening doors, windows, etc. The vapour clears quickly with no tendency for subsequent "building up," and it is reasonable to suppose that no danger to man is likely to arise therefrom. After fumigation the bugs are found dead usually in their customary hiding places. The results of disinfestation of over 300 houses have been very promising, and investigations into the best methods of applying the naphtha are still engaging the attention of the experts.

A specification for a suitable heavy coal tar naphtha is as follows:—

Colour.—Shall not be darker than a freshly prepared solution of 1 ml. of N/10 iodine in 1,000 ml. of distilled water.

Specific gravity.—Not less than 0.835 and not greater than 0.910 at 15.5° C.

Water.—Shall be free from water and other visible impurities at 15.5° C.

Distillation range.—Method as defined in B.S.S. No. 479 for coal tar naphthas:

Up to 160° C. not more than 5 ml.
„ 190° C. „ less „ 90 „

Flash-point (Abel).—Not less than 105° F.

Phenols and tar bases.—Not more than 0.25 per cent. of phenols and 0.25 per cent of tar bases.

The constituent or mixture of constituents which is toxic to the bed-bug is not known.

"Border Line" Knowledge

A New Step in Bibliographic Technique

UNDER a new agreement between the Central Agricultural and Scientific Bibliography and the Bureau of Chemical Abstracts (the Chemical Society and Society of Chemical Industry) it has been arranged that the staff of abstractors engaged on abstracting work for that bureau will be invited to act as abstractors in the interests of the C.A.S.B., to the extent that while engaged on their ordinary work they will also prepare a comprehensive list of those articles and papers published in the same journals, which should in their opinion be specially useful to subscribers to Section 1 (Agriculture and Allied Industries) of the C.A.S.B. In this manner, a considerable number of references will be made available which represent "border-line" knowledge not ordinarily covered by the world's existing bibliographies devoted to agricultural subjects. The scheme has been in operation since January 1, and it is proposed to issue shortly the first bibliography in this series to all subscribers to the C.A.S.B.

Each year there are published in the world's scientific and technical journals no fewer than 750,000 articles and papers of undoubted interest. Yet to-day it may be said that only about 280,000 of these are recorded in the bibliographies.

National Defence Contribution

Examples of Methods of Computation

THE new profits tax has been framed with the object of making industry contribute to the cost of national defence, and although the principle upon which the plan is based may be theoretically sound, directors of companies are advised to study the white paper carefully in order to avoid an excessive assessment at the end of the first accounting period. The official explanations of the incidence of this tax are, however, extremely vague, and for the benefit of readers who are seeking further information a number of examples are given below in which the capital is assumed to be £100,000 and the standard profit, £7,000 :—

(a) Current profit, £7,800.—As the current profit falls short of £12,000 by £4,200, an abatement equal to one-fifth of £4,200 or £840, would be allowed, reducing the current profit to a figure below the standard, so that no contribution would be payable.

(b) Current profit, £9,000.—In this case the abatement would be one-fifth of £3,000, or £600, reducing the current profit to £8,400. As both standard and current profits are below 10 per cent. of capital, one-fifth of the growth, or £280 would be payable.

(c) Current profit, £12,500.—As the current profit exceeds 10 per cent. but does not exceed 15 per cent. of capital (the actual percentage being 12½ per cent.) one-fifth of 3 per cent. (10 per cent. less standard profit 7 per cent.) would be payable, plus one-quarter of rest of growth, making £1,225, thus one-fifth of £3,000, £600; one-quarter of £2,500, £625; Total £1,225.

(d) Current profit, £20,000.—As the current profit exceeds 15 per cent. (actually it is 20 per cent.) the contribution payable would be ascertained as follows :—One-fifth of £3,000, £600; one-quarter of £5,000, £1,250; one-third of £5,000, £1,666; Total, £3,516. The methods of computation to be adopted when the standard profits are in excess of 10 per cent. of capital are indicated in the following examples in which the capital has been taken at £100,000 and the standard profit at £12,000 :—(a) Current profits, £12,500.—As the current profits do not exceed 15 per cent. one-quarter of the growth, or £125, would be payable. (b) Current profits, £20,000.—As the current profits exceed 15 per cent. the amount of contribution payable would have to be ascertained as follows :—One-quarter of £3,000, £750; one-third of £5,000, £1,666; Total, £2,416.

History of Pure Chemistry

A Handbook from the Science Museum

A HANDBOOK dealing with the history and development of pure chemistry has been prepared by Mr. A. Barclay, A.R.C.S., A.I.C., assistant keeper in charge of the Chemistry Collections in the Science Museum (price 1s. 6d.).

The book, which contains 14 plates, describes the methods and speculations of the ancient civilisations, the period of alchemy and the search for the philosopher's stone, beginnings of scientific and quantitative chemistry, and the theoretical and practical advances of the nineteenth century. It is completed with separate accounts of organic chemistry, physical chemistry, and modern atomic theory. Each chapter gives a concise and interesting account of its subject, and there is a full index and also a list of references to books, pamphlets and journals relating to chemistry which may be consulted in the science library attached to the museum.

Chemical Matters in Parliament

Vegetable Oil Corporation

IN the House of Commons, on Monday, Mr. Moreing (for Mr. Chorlton) asked the Secretary of State for Foreign Affairs whether he had any information about the China Vegetable Oil Corporation; whether the controlling interest in the corporation was held by the Chinese Government; and whether it was the policy of the corporation to enter into competition with private traders in the marketing of wood oil.

In reply, Viscount Cranborne said he had been kept informed by His Majesty's Ambassador in China on the subject. The controlling interest in the corporation appeared in practice to be held by the Chinese Government. From such indications of the corporation's policy as could be discerned at present, it appeared possible that it must undertake the marketing of wood oil as soon as it was in a position to build up the necessary organisation.

United States Magnesite Industry

Advance Statistics for 1936

SHIPMENTS of dead-burned magnesite, mostly for lining steel furnaces, jumped to an all-time record during 1936, according to figures compiled by the United States Bureau of Mines. Domestic mines yielded 207,100 short tons of crude magnesite, an increase of 17 per cent. over the output of 1935. Of this quantity not more than 1,700 tons valued at $24,400 was sold without calcining, while sales of caustic calcined magnesite of domestic origin amounted to only 8,000 tons valued at $221,400. Most of the mine output was burned into refractory magnesite by producers, whose sales of dead-burned products rose to 90,000 tons valued at $1,713,500. The tonnage of dead-burned magnesite sold in 1936 greatly exceeded that reported for any previous year since the resumption of imports after the world war and represents a 14 per cent. improvement over the 78,700 tons marketed in 1929. The total apparent consumption of dead-burned magnesite in the United States, including imports, likewise showed a perceptible increase amounting to 132,600 tons in 1936 compared with 129,100 tons during the 1929 boom year, and only 22,500 tons in 1932 when the industry hit the bottom of the depression.

No definite revival of the use of caustic calcined magnesite was manifest in 1936 but, according to reports from Mellon Institute, the utility of magnesium oxychloride cements may be greatly enhanced and their shortcomings eliminated by adding 10 per cent. of finely divided copper powder to the mixture. A dozen years ago the domestic consumption of caustic calcined magnesite for stucco and flooring was around 40,000 tons annually, but later dropped to less than one-fourth this quantity.

China as a Market for British Goods

400 Million Customers

THE mere mention of 400 million potential customers fills enterprising sales manager with visions of big business, but the Chinese are a conservative people whose habits demand a very special approach. This, at least, is the conclusion of an American business man who has spent twenty-five years in Shanghai, and has now written a fascinating and informative book ("400 Million Customers." By Carl Crow Hamish Hamilton. 10s. 6d.).

When a new product is marketed in China it is impossible to predict the sales, but it is certain that a Chinese or Japanese manufacturer will try to make a similar article at a cheaper price. Moreover, the Chinese manufacturer is a "shameless imitator of trade marks." Fortunately, the consumer is a good judge of quality, and will usually continue to use the better article; the idea that the Chinese are only interested in price appears to be a fallacy. Certain brands of British cigarettes, soap and tooth paste are so firmly established that it has proved impossible to introduce new and equally good manufactures. But great progress has been made in recent years in selling to the Chinese woman, who "has broken out of the inner courtyards of the home, and nothing will ever put her back again." New cosmetics and fashion garments are making strides all the time.

Although an American, Mr. Crow has dealt largely with British firms and is able to take a dispassionate view of his countrymen. Explaining that "high-powered" salesmanship does not go down with the Chinese, he contrasts the attitude of American consumers who "appraise a salesman's technique with the eye and the ear of a connoisseur, enjoy a good performance, and are irritated by a poor one." More than two thousand years ago, Confucius taught his followers to be suspicious of eloquence of any sort, specially of eloquence designed to part them from their money. The result is that there is to-day no such term as sales manager in the Chinese language; when a translation is necessary the term business manager is used instead.

"Face saving" is an important factor in Chinese psychology. An unsatisfactory employee is not discharged, but is promoted to a distant branch, whereupon he takes the hint and resigns, this being "accepted with a great show of regret." If a job is done badly, it is not usual to appeal to the sense of fairness or honesty of the supplier, but to point out instead the amount of face which would be lost through sending out poor work. Wealthy Chinese business men think that it gives them great face to come late to the office.

In an instructive chapter entitled "John Bull and Uncle Sam as Exporters," Mr. Crow pays a gracious compliment to the stability and integrity of British firms, and makes some valuable suggestions for improving our position in this market. "There are," he says, "a number of Shanghai men with British agencies who have suspiciously low golf handicaps." While our manufacturers still turn out "the best product it is possible to make, ... the American was the first to discover that art is a valuable aid in the selling of goods." On the whole, English conservatism is a help rather than a hindrance, but conditions are beginning to change, and it is significant that China now has 26,000 miles of motor roads, almost all built in the past ten years.

Laboratory Table Tops

A New Ceramic Material

EXPERIENCE has shown that the materials commonly used in making laboratory table tops do not inherently fulfil in the highest degree the exacting requirements of such service. Wood, for instance, is not fireproof and repeated applications of protective finishes are required in order that it may withstand chemical action. Asbestos is fireproof, but it must have special fabrication to provide adequate strength and acid-resistance. Soapstone, one of the most generally used materials, does not long retain its smoothness and pleasing appearance because it is relatively soft and will crack or spall when subjected to localised heating. Vitrified tile is used in many laboratories, but, because it is produced in small sections, tops made from it have many dirt-collecting joints; it is difficult with tile to attain even a relatively smooth surface.

These considerations led to the thought that it might be possible to find a new material that would have none of these disadvantages. Experimental work at Mellon Institute, Pittsburgh, extending over a period of years, resulted in the production of a porous, non-warping ceramic body that is impregnated with bituminous substances, and then heated under special conditions to form coke in the pores. In this new material—known as "Kemite"—usually high resistance to thermal shock is obtained because artificial cordierite, a mineral that has a very low thermal expansion, is used in making up the ceramic body. Thus there was produced a material that can be polished to velvety smoothness, possessing sufficient hardness to resist scratching and abrasion, ample structural and impact strength, density that prevents absorption of liquids, resistance to solvent action and chemical attack, and the ability to withstand perfectly the effect of rapid heating and cooling.

The methods of manufacture are interesting and, with respect to the molding, unusual. The batch of ceramic body, in the form of a slurry, is poured into molding pans of special construction. These pans are placed in a pressure tank so designed that, when air under pressure is admitted, the water is forced out of the slurry in a manner similar to the operation of filter pressing and the clay mixture in each pan takes the form of a compact slab. Each slab is removed from its pan and dried, and then fired in a vertical position in a tunnel kiln. In the latter process the slab becomes hard and rigid and can be handled independently in subsequent operations. It is then ground to a specified thickness and cut to the required length and width. It is then immersed in a bath of liquid bitumen and completely impregnated under pressure. After heat treatment in a tightly-closed oven to expel the volatile constituents of the impregnant and, at the same time, to form a residue of coke in the pores of the body, the slab is given a final polish and is then ready for installation.

The properties of Kemite are as follows—Weight per cu. ft., 117 lb.; specific gravity, 1.87; water absorption, 0.75-1.0 per cent.; transverse strength, 3,000 lb. per sq. in.; crushing strength, 11,300 lb. per sq. in.; coefficient of expansion (R.T.-450° C.), 0.0000025.

Kemite has proved to be a satisfactory material for table tops, hoods, and other forms of laboratory equipment. Karcite—a non-cordierite modification—is being used for shelves, sinks, tanks, pipes, and pipe fittings. Either material can be employed for flooring to meet the special requirements in the laboratory and the chemical industry. In the latter field, Kemite should prove useful for vats and tanks, because of its resistance to the action of chemicals and its low thermal expansion.

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HYDROCARBONS.—Polycyclic aromatic hydrocarbons. J. W. Cook, A. M. Robinson and F. Goulden, *J.C.S.,* 1937, 393-396.

PLASTICS.—The production of plastics materials: Urea-formaldehyde resins. H. Barron, *India Rubber J., 93,* 5-6.

CATALYSIS.—Cerium compounds in industry: Their value as catalytic agents. B. S. Hopkins and W. A. Talbel, *Chem. Trade J., 100,* 377.

ORGANIC.—Phenolic and other constituents of aqueous liquors from coal carbonisation. G. T. Morgen and A. E. J. Pettet, *J. Soc. Chem. Ind., 56,* 109-114 T.

The combination of fatty acids with nitrogen bases. E. B. R. Prideaux and R. N. Coleman, *J.C.S.,* 1937, 462-465.

ANALYSIS.—Works analysis in the acetate rayon factory. *Silk and Rayon, 11,* 350-355.

The potentiometric estimation of lead with sulphide solutions. G. Lal Maheswari and J. B. Jha, *J. Indian Chem. Soc., 14,* 42-45.

The determination of sulphites in the presence of nitrates and nitrites. J. G. Sherratt, *Analyst, 62,* 267-271.

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MISCELLANEOUS.—The uses of synthetics in perfumery. M. Lovat-Hewitt, *Perfumery Essential Oil Rec., 28,* 130-135.

A new series of buffer mixtures covering the *p*H range 1—6. W. L. German and A. I. Vogel, *Analyst, 62,* 271-280.

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OILS.—The rate of linseed oil oxidation with driers. A. J. Currier and I. Harvey-Kagarise, *Ind. Eng. Chem., 29,* 467-469.

Tung oil and oiticica oil. H. P. Kaufmann and J. Baltes, *Paint Varnish Prod. Manager, 16,* 32-34.

ANALYSIS.—A method of determining small amounts of ammonia and other bases by the use of boric acid. A. E. Sobel, H. Yuska and J. Cohen, *J. Biol. Chem., 118,* 443-446.

OLEFINES.—The reaction between sulphur dioxide and olefines. F. J. Glavis, L. L. Ryden and C. S. Marvel, *J. Amer. Chem. Soc., 59,* 707-711.

PIGMENTS.—Survey of dry and dispersed colors. M. B. Doty, *Paint Oil Chem. Rev., 99,* No. 8, 10-14.

INORGANIC.—Potash from polyhalite: Relation between calcination conditions and extraction behaviour. J. Davidson, A. Buck, J. Conley and E. Partridge, *Ind. Eng. Chem., 29,* 475-482.

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ALCOHOLS.—The synthesis of methanol and higher alcohols from water gas. G. Natta, *Osterreichischer Chem. Ztg., 40,* 162-170.

HYDROCARBONS.—Quantitative separation and purification of hydrocarbons by desorption in vacuum. K. Peters and W. Lohmar, *Angew. Chem. Beihefte,* No. 25.

ORGANIC.—The reaction of some metal chlorides with phenol and -naphthol. H. Funk and W. Baumann, *Z. amorg. Chem., 231,* 264-268.

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The carbohydrates: Cellulose and its solutions. T. Lieser and R. Ebert, *Annalen, 528,* 276-295.

TANNING.—The acid content of vegetable tanning extracts. A. Ponte and G. Cavallone, *Collegium,* 1937, II, 68-75.

ANALYSIS.—The estimation by titration of small quantities of bromine in the presence of chlorides. H. Doering, *Z. analyt. Chem., 108,* 255-258.

The quantitative determination of small quantities of hydrocyanic acid. K. O. Möller and K. Stefanson, *Biochem.-Z., 290,* 44-57.

Spectro-analytical determination of potassium. W. Schuknecht, *Angew. Chem., 50,* 299-301.

PAPER.—The effect of the filler on the technical properties of paper. W. Brecht and H. Pfretzschner, *Papier Fabrikant (techn. Teil), 35,* 96-100, 103-107.

OILS.—Rapid methods for the preparation of stand oil. E. Rossmann, *Fette u. Seifen, 44,* 59-60.

The congealing of mineral oils. A. Bondi, *Petroleum Z., 33,* No. 14, 1-5.

The characteristic action of different kinds of bleaching earths in the bleaching of various oils. E. Erdheim, *Petroleum Z., 33,* No. 15, 4-8.

CATALYSIS.—Zinc oxides obtained by the thermal decomposition of various complex zinc oxalates as catalysts for the decomposition of methanol. G. F. Hüttig and H. Goerk, *Z. amorg. Chem., 231,* 249-263.

DISTILLATION.—The vacuum distillation of oils. F. Spaûsta, *Brennstoff-Chem., 18,* 153-160.

CORROSION.—A colour test for corrosion by means of *p*H indicators. N. Goldowski, *Korrosion u. Metallschutz, 13,* 128-131.

SOAP.—The manufacture of cheap toilet soaps and their perfuming. *Deutscher Parfumerie Ztg., 23,* 142-143.

PLASTICS.—Faults in the manufacture of safety glass with cellulose ester interlayers. T. Pesch, *Chemiker-Ztg., 61,* 296-298.

ETHERIFICATION.—The alkylation of ketones using sodamide: The propylation of ketones. I. N. Nasarov, *Ber., 70,* 594-598.

NITRATION.—The study of the mixed acids: The system HNO_3—H_2SO_4—H_2O. E. Berl, K. Andress and E. Escales, *Kunststoffe, 27,* 124-127.

SAPONIFICATION.—The saponification of fats. *Deutscher Perfumerie Ztg., 23,* 144-145.

MISCELLANEOUS.—Dioxane compounds of alkali metal and ammonium halides. H. Rheinboldt, A. Luyken and H. Schmittmann, *J. prakt. Chem., 148,* 81-87.

Glass electrodes for the control of the *p*H value. K. Schwabe, *Z. Elektrochem., 43,* 152-155.

On thioglycerine. H. Rheinboldt and C. Tetsch, *Ber., 70,* 675-680.

French

OILS.—The vaseline oils and white oils: Manufacture, applications, and secondary products. E. Pyhala, *Matières Grasses Pétrole Dérivés, 29,* 97-99.

EXPLOSIVES.—The measurement of the stability of explosives by the determination of the *p*H value. M. Déribéré, *Rev. Générale Matières Plastiques, 13,* 79-82.

ENAMEL.—The application of boric anhydride to enamels. R. Aldinger, *Verre Silicates Ind., 8,* 137-138.

ORGANIC.—Derivatives of iodo-naphthalene-1 sulphonic acid. H. Goldstein, T. Blezinger and H. Fischer, *Helv. Chem. Acta, 20,* 218-220.

The auto-oxidation of cyclic ethylenic hydrocarbons. R. Dupont, *Bull. Soc. chim. Belge, 46,* 21-26.

BLEACHING.—The bleaching of rag pulps by means of hypochlorite of lime. R. C. Crain, *Papier, 40,* 213-231.

ANALYSIS.—The separation of phosphoric acid in qualitative analysis. G. Charlot, *Bull. Soc. chim.,* 1937, No. 4, 676-682.

PAPER.—Molybdenum and paper manufacture. L. Demyb, *Papeterie, 59,* 309-310.

MISCELLANEOUS.—Chemical investigations on petroleum hydrocarbon lubricants. E. André and A. Maurel, *Bull. Soc. chim.,* 1937, No. 4, 727-735.

Personal Notes

MR. GEORGE GRAY, a past-chairman of the Chemical Engineering Group and vice-president of the Institution of Chemical Engineers, died last week at the age of 45. He studied chemistry at Liverpool University, where he took his M.Sc. degree, and spent his working life in the soap trade. After some years at Port Sunlight he was transferred to Bristol and became chairman of Christopher Thomas, Ltd., an associated company of Lever Brothers, Ltd. Later he came to London and took charge of one of the main divisions into which the Lever sales organisation was divided. Mr. Gray became a Fellow of the Institute of Chemistry in 1922. His father was Mr. John Gray, a former president of the Society of Chemical Industry, in whose memory the "John Gray Memorial Scholarship" was founded.

Mr. George Gray.

DR. R. G. W. NORRISH, Ph.D., F.R.S., professor of physical chemistry at the University of Cambridge, has been elected to a Professorial Fellowship at Emmanuel College.

PROFESSOR W. L. BRAGG, F.R.S., at present Langworthy Professor of Physics in the University of Manchester, is to be director of the National Physical Laboratory. Professor Bragg will assume duty during next autumn. The previous director was Sir Joseph Petavel, who died in March last year. Sir Joseph's salary was £1,750 a year, with free residence.

MR. LEWIS G. COHEN, a director of Drug Houses of Australia, Ltd., and Elliotts and Australian Drug, Ltd., is on a visit to England.

MR. W. G. WAINWRIGHT, B.Sc. (Wales), has been appointed demonstrator in chemical technology in the Faculty of Technology at the University of Manchester.

MR. DONALD YATES, superintendent of the Broken Hill Associated Smelters Pty., Ltd., of Port Pirie, South Australia, has been elected president of the Australasian Institute of Mining and Metallurgy for 1937.

MR. GEORGE A. HARVEY, of Brighton, the founder of G. A. Harvey and Co. (London), Ltd., sheet metal workers and makers of chemical plant, left estate valued £38,527, with net personalty £35,988.

MR. GORDON COWELL, who has been manager of Dullatur Colliery, Dumbartonshire, since the opening of the colliery, has been appointed to a colliery managership at West Calder by Scottish Oils, Ltd., Linlithgow.

MR. WILLIAM STIRLING, who is relinquishing his position as principal chemist and works manager at the works of William Briggs and Sons, Ltd., at Dowrie, near Arbroath, has been presented with a travelling rug and umbrella on behalf of the employees.

MR. J. F. LINCOLN, president of the Lincoln Electric Co., in whose honour the James F. Lincoln Arc Welding Foundation was created, is expecting to visit England in the latter part of this month or early in June. He will give a number of addresses on various phases of arc welding.

DR. HARRY BARRON broadcast a talk on "Some British Raw Materials," from the London Regional Station on Monday. The talk was concerned with the present position of the United Kingdom, showing that apart from coal we were dependent on outside sources for primary raw materials.

Chemical Notes from Foreign Sources

Czechoslovakia

CHRYSOBERYL DEPOSITS recently located in Moravia are to be exploited as a source of beryllium.

Belgium

MANUFACTURE OF ETHYLENE GLYCOL has been successfully launched by the Société Carbochimique, according to a statement at the annual meeting of the company.

France

THE SOCIETE PARISIENNE DE PRODUITS CHIMIQUES, 18 rue du Landy, La Plaine-Saint-Denis (Siene), has been registered with a capital of 200,000 francs. It has acquired the rights to several patents relating to degreasing agents.

FRENCH AND BELGIUM MANUFACTURING RIGHTS for casein artificial wool (lanital) are reported to have been acquired by a woollen group in Northern France. A company styled "Lanital française" will be formed and production is to commence in September at the rate of 10 tons per day.

Germany

THE ALLEGED TOXIC EFFECTS OF DIOXAN have been subjected to examination and confirmed by Wirth and Klimmer ("Arch. Gewerbepathol," 1936, *7*, 192). When repeatedly inhaled over a period, slight inflammation of the respiratory tract is first noted and this is eventually followed by paralysis. Dioxan is regarded as being comparable in toxicity (when inhaled) to methyl alcohol. On the other hand, mere contact with the skin over long periods did not produce any marked symptoms. As a respiratory poison, dioxan produces symptoms of excitability in human beings when present in the air in a concentration of 5 milligrams per litre.

Austria

MANUFACTURE OF STARCH AND STARCH DERIVATIVES is planned by the newly-formed Oberösterreichische Starke-und chemische Industrie A.G., of Aschach (Danube).

Japan

A RANGE OF MINERAL PIGMENTS is to be produced by the newly-registered Oji Kagaku Kogyo K.K. (capital 1 million yen).

TO ENCOURAGE HOME PRODUCTION OF LUMINOUS PAINTS the Japanese Government is granting a subsidy of 12,000 yen to the Japan Luminous Paint Manufacturing Co.

Glass Manufacture in India

A Substitute for Soda Ash

SODA ash, which is a necessary raw material for the manufacture of glass, has to be imported into India at a price about 50 per cent. higher than that at which soda ash is obtainable in England. Recent investigations, however, show that it may be possible to replace about 50 per cent. of the soda ash with certain kinds of rock which are of Indian origin. A paper on the subject has been published by the Industrial Research Bureau of the Government of India. The rocks in question, which are of the nepheline syenite series is found in large deposits at Krishnagarh (Rajputana), in Kathiawar, in the Coimbatore district (Madras), and near Vizagapatam. It contains a high percentage of ferro-magnesium minerals, but this drawback may be overcome by special treatment.

From Week to Week

JOHN TAYLOR AND SONS announce that they are resigning their appointment as London managers of the British Burmah Petroleum Co., Ltd., as from May 20.

A TAR WAGON WAS DESTROYED BY FIRE in Leeds last week, when flames 30 feet high scorched shop fronts and cracked windows. The blazing tar ran down the road in a stream.

THE NAME of Howroyd, McArthur and Co., Ltd., manufacturers and importers of tanning extracts, etc., Liverpool, has been changed to Liverpool Chemical Products Co., Ltd.

INTERNATIONAL PULVERISERS, LTD., have received from Moscow a first order for six of their Pulmac mills, to go to Russia for dealing with powders. Further orders in the near future are anticipated.

THE NOMINAL CAPITAL of William Pearson, Ltd., manufacturers of disinfectants and sanitary compounds, etc., has been increased by the addition of £25,000 in £1 6 per cent. first preference shares beyond the registered capital of £15,000.

FOR THE ACQUISITION of the issued shares of British Bottles, Ltd., the nominal capital of United Glass Bottle Manufacturers, Ltd., has been increased by the addition of £1,100,000 beyond the registered capital of £1,500,000. The additional capital is divided into 600,000 preference and 500,000 ordinary shares of £1 each, ranking pari passu with existing shares.

A REPRESENTATION has been made to the Board of Trade under Section 10(5) of the Finance Act, 1926, for the exemption of myristic acid from Key Industry Duty. Any communications should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, not later than June 3.

THE BRANSTON ARTIFICIAL SILK CO., LTD., announces that the company will be in a position to repay on or after May 31, its outstanding interest-bearing notes at the rate of £22 10s. per note. An interest warrant will be sent to holders or their bankers on June 1, for the period January 1 to May 31, at 5 per cent., less tax.

FISON, PACKARD AND PRENTICE, LTD.., manufacturers of sulphuric acid, chemical fertilisers, chemicals, etc., have increased their nominal capital by the addition of £750,000 beyond the registered capital of £1,000,000. The additional capital is divided into 500.000 5 per cent. second cumulative preference and 250,000 ordinary shares of £1 each.

JOINT EXCLUSIVE EXPLORATION LICENCES for two years over 115,000 square miles of British East Africa have been granted to the D'Arcy Exploration Co. and the Anglo Saxon Petroleum Co. No other licence will be issued within a year. Reports published in Nairobi last year suggested that an oilfield had been discovered in Kenya large enough to supply all the requirements of British Africa south of the equator.

NEW PLANT COSTING £10,000 is being added to the works of the West Cumberland By-Products Co., at Flimby, Maryport. It is for a new process for the manufacture of carbon disulphide for the wrapping-paper and artificial silk industries of the border area, and production will begin in the summer. Some parts of the plant have been imported, but most of it has been made at Carlisle.

B.A. COLLIERIES, LTD., which is an amalgamation of Bestwood, Babbington and Digby Collieries, announces that after investigating the question of low temperature distillation generally and many processes in this country and abroad, it has decided that the Suncole process of the British Coal Distillation, Ltd., most fully meets its requirements, and it has arranged with that company to erect a plant at one of the collieries in the neighbourhood of Nottingham. The plant will be capable of treating 450 tons of coal per day, and the tenders are now under consideration.

IMPORTS OF CHEMICALS, DRUGS, DYES, ETC., into the Irish Free State during the March quarter, showed an increase in value over the corresponding period in 1936. Details are as follows: Chemical manufactures and products: Acids, £6,391 (against £6,427 last year); calcium carbide, £3,198 (£1,394); chemical food preservatives and flour improvers, £2,964 (£21,557); copper sulphate, nil (£19); disinfectants, etc., £6,631 (£7,881); potassium compounds, £2,667 (£2,607); sodium compounds: caustic, £4,023 (£3,395); other sorts, £22,171 (£27,869); cream of tartar, £2,797 (£2,380); other chemical manufactures and products, £54,086 (£37,574); perfumery, cosmetics, etc., £6,009 (£5,753); medicines and medicinal preparations, £86,460 (£66,912); dyes, dyestuffs and tanning materials: for dyeing, £11,118 (£8,884); for tanning, £16,334 (£11,808); paints, distempers and enamels (liquid and paste), £7,903 (£9,059); lead, white (including stiff paste), £6,936 (£7,239); ochre and earth colours, £2,508 (£3,002); other descriptions, £19,071 (£15,801); total £261,267 (£239,561). Imports of fertilisers also increased in value as compared with last year; the total for the quarter being £164,182, against £148,480.

SUCCESSFUL EXPERIMENTS IN THE MANUFACTURE OF AIRCRAFT PETROL from crude oil by a process of hydrogenation have been carried out by the naval fuel depot at Tokuyada in Shikoku.

THE DIRECTORS OF BOOTH'S DISTILLERIES announce that certain negotiations are pending which, if carried through successfully, will, in their opinion, be to the advantage of the company.

A COMMITTEE HAS BEEN APPOINTED to consider the production of calcium carbide in the United Kingdom, with Sir Gilbert Morgan, director of the Chemical Laboratory, Teddington, as technical assessor.

UP TO THE PRESENT DATE fifteen low temperature carbonisation plants have been tested by the Department of Scientific and Industrial Research under the Government's scheme for testing such plants.

THE ROCKFELLER FOUNDATION has made a grant of £5,000 to be spread over four years in support of the research work in biochemistry being carried on at the University of Manchester under the direction of Professor Heilbron.

NEW CHEMICAL LABORATORIES for Newton Chambers and Co., Ltd., were opened at Thorncliffe, near Sheffield, on April 28, when Lady Roberts, wife of Sir Samuel Roberts, chairman of the company, killed eight thousand million germs as part of the formalities.

THE STEADILY INCREASING DEMANDS for Nordac products have made it necessary for Nordac, Ltd., to take larger premises for new and improved plant. The company's address from next Monday will be 164 Dukes Road, Western Avenue, Acton, W.3. (Telephone: Acorn 1319.)

WORKERS AT THE OIL WORKS and shale mines of Scottish Oils, Ltd., Linlithgow, have received, as from May 5, a wage increase of 6d. per day for all employees of 18 years of age and over and 3d. per day for all employees under 18 years of age. These increases do not apply in the case of apprentices. Grangemouth and Middletonhall oil workers will also share in the increases.

New Companies Registered

Rumex Oil Products, Ltd.—Registered April 15. Nominal capital £10,000. Producers of and dealers in oils, oil products, bitumen, tar products, etc. Subscribers: Dudley C. Giddins, "Thaxted," Queenscourt, Wembley, and F. A. Randall.

James Law (Chemicals), Ltd.—Registered April 9. Nominal capital £4,000. To acquire the business of chemical manufacturers carried on by W., P. and Hilda H. Cryer, Jas. P. E. Law and Rhoda Lumsden, at Brook Works, Castleton, Rochdale, as "James Law." Directors: Wm. Cryer, 6 Underwood Villas, Dearnley, Littleborough, nr. Rochdale, P. Cryer, J. P. E. Law, H. H. Cryer, and R. Lumsden.

Farnell Carbons, Ltd.—Registered March 31. Nominal capital £15,000. Manufacturers of and dealers in activated and decolourising carbons, gels, activated and natural earths, kieselguhr, chemicals and manures, charcoal burners and grinders, distillers, dyemakers, metallurgists, sawdust and sand contractors, makers of and dealers in disinfectants, Swedish lamp black and all materials and apparatus used in connection therewith, etc. Directors: Robin G. W. Farnell, 1a Conduit Road, Plumstead, S.E.18, and Mrs. M. E. V. Hill.

Varnish Gums, Ltd., 16 Water Lane, E.C.3.—Registered April 2. varnish, japan,Congo gum, copal varnish, japan and colour importers, manufacturers of and dealers in chemical and other preparations and paint removers, to act as selling agents in the United Kingdom for R. L. Settles & Co., of Antwerp, Belgium, and the Congo, for Congo gum copal, etc. Directors: George D. F. Keddie, H. Harrison, and L. Settles. Solicitors: David and Davis, 11 Queen Victoria Street, E.C.

Anti-Gas, Ltd., St. Leonards Works, Hancock Road, Bromley-by-Bow, E.3.—Registered April 1. Nominal capital £100. Manufacturers, repairers, importers and exporters of and dealers in masks, respirators, and any other equipment, apparatus and materials, whether manufactured or not for the purpose of protection against poison gases or any other noxious, asphyxiating or deleterious substances and materials, etc. Directors: Colin J. C. E. Healey and J. C. Howard.

New Insulation Co., Ltd., Abbey House, Westminster, S.W.1.—Registered April 3. Nominal capital £21,000. To enter into agreements (1) with the British Permali Co., Ltd., and (2) with Arthur A. Heath, to purchase and sell by wholesale or retail, and transport hardwoods, softwood and woods capable of being rendered flexible by all known elements, to alter their character and prepare them for electrical, chemical, mechanical, heating or sounding purposes, to render them impervious to sound, to purchase, sell and manufacture paper, tissues and fabrics and all kinds of ceramic, vitreous or fusible insulating material, etc. Directors: Arthur A. Heath, Lt.-Col. C. R. Hitchins, W. R. Hennion, H. Steinmann, and R. Schwartz.

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

PREPARATION OF DERIVATIVES OF HYDROFORMED NAPHTHAS.—Standard Oil Development Co. Oct. 16, 1935. 17132/36.

MANUFACTURE OF MERCAPTO THIAZOLES.—Wingfoot Corporation. Oct. 16, 1935. 22142/36.

PRODUCTION OF BASE EXCHANGING MATERIALS.—Electrolux, Ltd. Oct. 18, 1935. 24032/36.

MANUFACTURE OF MOULDING RESINS.—Bakelite, Ltd. Oct. 14, 1935. 24312/36.

EXTRACTION OF COAL.—I. G. Farbenindustrie. Oct. 15, 1935. 27760/36.

MANUFACTURE OF BASIC SUBSTITUTED CARBOXYLIC ACID AMIDES.—Deutsche Hydrierwerke, A.-G. Oct. 16, 1935. 28210/36.

SIZING AND DRESSING AGENTS FOR TEXTILES.—Pfeifer and Langen Kommanditges. Oct. 16, 1935. 28219/36.

METHODS OF PURIFYING GASES.—British Thomson-Houston Co., Ltd. Oct. 17, 1935. 28277/36.

MANUFACTURE OF CONDENSATION PRODUCTS AND AQUEOUS SOLUTIONS THEREOF and their application in tanning.—I. G. Farbenindustrie. Oct. 18, 1935. 28366/36.

PRODUCTION OF FAST SHADES.—Soc. of Chemical Industry in Basle. Oct. 19, 1935. 28367/36.

Specifications Accepted with Date of Application

PROCESS FOR IMPROVING LUBRICATING-OILS.—Ruhrchemie, A.-G. July 10, 1934. 464,393.

MANUFACTURE OF COLOURING MATTERS.—M. Wyler, and Imperial Chemical Industries, Ltd. July 10, 1935. 464,126.

BUTYL ALCOHOL FERMENTATION PROCESS.—Commercial Solvents Corporation. July 12, 1934. 464,127.

PRODUCTION OF OILS RICH IN VITAMINS.—E. W. Fawcett, D. Whittaker, and Imperial Chemical Industries, Ltd. Oct. 19, 1935. 464,395.

MANUFACTURE OF 17-HYDROXY-3-KETO-COMPOUNDS of the cyclopentano polyhydrophenanthrene series.—W. P. Williams (Schering-Kahlbaum, A.-G.). Sept. 9, 1935. 464,396.

PROCESS FOR THE MANUFACTURE OF CONDENSATION PRODUCTS.—A. Carpmael (I. G. Farbenindustrie.) Sept. 11, 1935. 464,276.

MANUFACTURE OF UNSATURATED DIKETONES related to the follicle hormone.—Schering-Kahlbaum, A.-G. Sept. 15, 1934. 464,397.

REDUCTION OF SATURATED AND UNSATURATED GERMINAL GLAND HORMONES containing at least one keto group, their isomers, and derivatives.—W. P. Williams (Schering-Kahlbaum, A.-G.) Oct. 10, 1935. 464,271.

MANUFACTURE OF HYDROARYLATED AROMATIC HYDROXY COMPOUNDS and derivatives thereof.—W. J. Tennant (Henkel and Cie, Ges.). Oct. 9, 1935. 464,328.

MANUFACTURE AND PRODUCTION OF DYESTUFF PRINTING PASTES.—G. W. Johnson (I. G. Farbenindustrie.) Oct. 11, 1935. 464,283.

PROCESS FOR TREATING BOILER FEEDWATER for preventing salt incrustation of turbine blades.—A. Carpmael (I. G. Farbenindustrie.) Oct. 11, 1935. 464,403.

Applications for Patents

REMOVAL OF VOLATILE SULPHUR COMPOUNDS FROM LIQUIDS.—G. W. Johnson (I. G. Farbenindustrie). 9418.

APPARATUS FOR REMOVAL OF AMMONIA FROM GASES.—G. W. Johnson (I. G. Farbenindustrie). 9470.

IMPROVING DIESEL OILS.—G. W. Johnson (I. G. Farbenindustrie). 9605.

RECOVERY OF UNITARY CSCLIC COMPOUNDS.—G. W. Johnson (I. G. Farbenindustrie). 9740.

MANUFACTURE, ETC., OF DYESTUFFS of the naphthalene series.—G. W. Johnson (I. G. Farbenindustrie). 9741.

MANUFACTURE, ETC., OF CONCENTRATED HIGHLY OXIDISED OXIDES OF NITROGEN.—G. W. Johnson (I. G. Farrbcnindustrie). 9910.

RECOVERY OF UNITARY CYCLIC CCOMPOUNDS.—G. W. Johnson (I. G. Farbenindustrie). 9913.

MANUFACTURE OF OXIDISING OR REDUCING AGENTS.—W. F. Koch. 9391.

PREPARATION OF CELLULOSE ESTERS.—Kodak, Ltd. (United States, April 3, '36.) 9535.

SINTERING OF FINELY POWDERED MATERIALS.—F. Krupp, A.-G. (Germany, July 24, '36.) 9584.

FUNGICIDAL COMPOSITIONS.—E. C. Large. 9788.

MANUFACTURE OF IRON OXIDE PIGMENTS.—A. P. Laurie. 9436.

TREATING ETHEREAL OILS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, April 17, '36.) 9328.

DESULPHURISATION OF HYDROCARBONS.—Naamlooze Venootschap de Bataafsche Petroleum Maatschappij. (United States, April 13, '36.) 9924.

REFRACTORY CERAMIC MATERIALS.—M. Pirani. 9635.

MANUFACTURE OF ALKALI THIOCYANATES.—Röhm and Haas Co. (United States, April 9, '36.) 9565.

CONVERSION OF METAL ALKALI ACETATE into bicarbonates.—Soc. Internationale des Industries Chimiques et Derivés, Soc. Anon. 9240.

MANUFACTURE OF NEW CELLULOSE SOLUTIONS.—Soc. of Chemical Industry in Basle. (Switzerland, April 21, '36.) 9724.

Chemical and Allied Stocks and Shares

SINCE the beginning of the new Stock Exchange account on Monday a much better tendency has been in evidence in the stock and share markets and a fairly general recovery in share values has been established. This largely reflects the belief that the Finance Bill will show that the fears regarding the new tax expressed in some quarters have been much exaggerated. Another favourable factor was a somewhat better trend in metal and commodity prices, the weakness of which has recently had an adverse influence on the stock and share markets.

Shares of chemical and allied companies were in larger demand and reflected the movement to higher prices. Imperial Chemical which had declined to 37s. at one time are 37s. 6d. at the time of writing, which, however, compares with 38s. 6d. a week ago. Salt Union have moved in sympathy with the trend in Imperial Chemical shares and have been adjusted in price on the basis of the offer made by I.C.I. As compared with a week ago the price has moved up from 49s. 3d. to 53s. 3d. United Molasses have been more active, but at 29s. 7½d. are still a few pence lower on balance, although anticipations of an increase in the forthcoming interim dividend is a factor which is attracting attention. Turner and Newall put on 1s. 3d. to 98s. 9d., also aided by hopes of an increased interim dividend. Borax Consolidated were relatively steady at 31s. on attention drawn to the favourable yield offered on the basis of last year's 7½ per cent. dividend, and on the possibility of a further increase in the distribution for the current year. In some quarters there are anticipations that later in the year payment of an interim dividend may be resumed. General Refractories were better at 27s. 6d., an improvement of 1s. The 10s. ordinary shares of the latter company give a large yield as the past year's distribution was 16 per cent. Although increased capital will rank for payment there are hopes in the market that 16 per cent. will again be forthcoming for the current year, because fuller benefits may be derived from the further expansion of business, and, moreover, it has been indicated that income from dividends paid by subsidiaries will be included in profits. Greeff Chemicals are lower at 8s. 6d., but are now "ex" the dividend. British Glues and Chemicals remained around the lower price to which they went last week, and British Industrial Plasties were little changed at 2s. 10½d. British Plaster Board were better on reports that the company is actively employed, which has tended to increase hopes in the market that the dividend may again be brought up to 50 per cent. despite the larger capital in issue. Timothy Whites and Taylors and Sangers were both steady, and there was improvement in Boots Pure Drug to 53s. 6d. British Drug Houses were maintained at 22s.

Associated Portland Cement improved on attention drawn to the apparently favourable yield offered, and other cement shares were also inclined to make better prices. Imperial Smelting recovered 1s. to 18s. 9d. on the improvement in the price of zinc and on continued hopes that it may be possible to resume dividends for the current year with a moderate payment.

Stanton Iron and Staveley shares were both higher on balance, aided by the belief that these companies have again had a good year. Dorman Long and Consett Iron made better prices following their recent reaction. Richard Thomas were also better on hopes that the dividend may be increased to 15 per cent. As the company makes its accounts up to March 31, profits for the past year will not be liable to the N.D.C. tax. In respect of the current year, however, a N.D.C. payment will be due, and moreover a considerably larger capital will rank for dividend. Consequently it is not assumed in the market that if the dividend were raised to 15 per cent. for the past year it would necessarily be maintained at this rate.

Bleachers Calico Printers and other cotton textile shares have made rather better prices and Courtaulds improved. Oil shares were better, sentiment having benefited from the increased interim dividend of Trinidad Leaseholds which has induced confidence that the forthcoming final dividends of the "Shell" and Anglo-Iranian companies may also create a favourable impression.

Weekly Prices of British Chemical Products

PRICES of a number of coal tar products have risen during the week. All grades of benzole have been advanced by a halfpenny per gallon, and increases of from 4d. to 8d. per gallon are announced for all grades of cresylic acid. Carbolic acid (crude 60's) is 4d. per gal. dearer, but naphthalene has been reduced by 10s. per ton. In the pharmaceutical and photographic chemicals section, seidlitz powder (pulverised) is 60s. 6d.—64s. 3d. per cwt., against 58s. 9d.—62s. 6d. a week ago, and sodium potassium tartrate (Rochelle salt) is 2s. 6d. per cwt. dearer at 72s. 6d. There are no price changes to report in the London markets for general chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates.

MANCHESTER.—A generally steady undertone has been in evidence on the Manchester chemical market during the past week and even in those sections which during the past few months have displayed rather startling fluctuations much more stable conditions have obtained, little change on balance having occurred either in sulphate of copper or in the lead products. At the consuming end of the chemical trade active conditions have again been reported, with good quantities of the bread-and-butter lines being taken up against contract commitments. New bookings during the past week have been on a moderate scale. In the by-products section marked firmness characterises most classes of materials, with the light products and both carbolic and cresylic acids on a strong basis, and steady sales have been reported on this centre during the week.

GLASGOW.—There has been some improvement in the demand for chemicals for home trade during the week, though export business still remains very quiet. Lead and copper products are again easier on account of the lower metal prices. Red lead and litharge have been reduced during the week, but other prices generally continue very firm at about previous figures. Coal tar products continue very steady and one or two further price advances are reported. Motor benzole has been offered at 1s. 5d. to 1s. 5½d. per gallon and some minor transactions in solvent naphtha, xylol and 99/100 cresylic acid show further appreciation in values. There has been less activity during the week in the other grades of cresylic acid and merchants' stocks appear to have changed hands at lower rates than last quoted. Manufacturers, however, are still holding out for top prices. Fresh inquiries for creosote are numerous and oils of high tar acid content are in particularly strong demand.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACID, ACETIC.—Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £30 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ACID, BORIC.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

ACID, CHROMIC.—9¼d. per lb., less 2½%; d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 1s. SCOTLAND: B.P. crystals, 1s. per lb., less 5%, ex store.

ACID, FORMIC.—85%, in carboys, ton lots, £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works.

ACID, OXALIC.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

ACID, SULPHURIC.—168° Tw., £4 5s. to £4 15s. per ton; 140° Tw., arsenic-free, £2 15s. to £3 5s.; 140° Tw., arsenious, £2 10s.

ACID, TARTARIC.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £16 10s. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—£55 10s. per ton.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £17 ex store. MANCHESTER: White powdered Cornish, £17, ex store.

BARIUM CHLORIDE.—£10 per ton. GLASGOW: £11 5s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%. £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. GLASGOW: 70/75% solid, £5 10s. per ton net ex store.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. GLASGOW: 99%, £4 7s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£22 10s. per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

IODINE.—Resublimed B.P., 5s. 1d. per lb.

LEAD ACETATE.—LONDON: White, £35 10s. per ton; brown, £35. GLASGOW: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36; brown, £35 10s.

LEAD NITRATE.—£39 per ton.

LEAD, RED.—SCOTLAND: £37 per ton, less 2½%, carriage paid for 2-ton lots.

LEAD (WHITE SUGAR OF).—GLASGOW: £37 10s. per ton net, ex store.

LITHARGE.—SCOTLAND: Ground, £37 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

PHENOL.—6¾d. to 7¼d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £40.

POTASSIUM BICHROMATE.—SCOTLAND: 5d. per lb., less 5%, carriage paid.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 10s. per ton.

POTASSIUM IODIDE.—B.P. 4s. 3d. per lb.

POTASSIUM NITRATE.—£27 per ton. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 11d. to 1s.

POTASSIUM PRUSSATE.—6¼d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6¾d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. GLASGOW: Large crystals, in casks, £38.

SALT CAKE.—Unground, spot, £3 16s. 6d. per ton.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £12 15s. per ton in 1 cwt. kegs, £11 per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. MANCHESTER: 4d. per lb. GLASGOW: 4d., less 5% carriage paid.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£26 10s. to £30 per ton. Glasgow: £1 10s. per cwt.
Sodium Chromate.—4d. per lb. d/d U.K.
Sodium Hyposulphate.—Commercial, 2 ton lots d/d, £10 5s. per ton; photographic, £14 5s. Manchester: Commercial, £10; photographic, £14 10s.
Sodium Metasilicate.—£14 per ton, d/d U.K. in cwt. bags.
Sodium Nitrate.—Refined, £7 15s. per ton for 6-ton lots d/d.
Sodium Nitrite.—£18 5s. per ton for ton lots.
Sodium Perborate.—10%, 9½d. per lb. d/d in 1-cwt. drums.
Sodium Phosphate.—£13 per ton.
Sodium Prussiate.—4d. per lb. for ton lots. Glasgow: 5d. to 5¾d. ex store. Manchester: 4½d. to 4¾d.
Sodium Silicate.—£9 10s. per ton.
Sodium Sulphate (Glauber Salts).—£3 per ton d/d.
Sodium Sulphate (Salt Cake).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. Scotland: Ground quality, £3 5s. per ton d/d. Manchester: £3 10s.
Sodium Sulphide.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. Manchester: Concentrated solid, 60/62%, £11; commercial, £8.
Sodium Sulphite.—Pea crystals, spot, £13 5s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
Sulphate of Copper.—£20 per ton, less 2%, in casks. Manchester: £23 per ton f.o.b. Scotland: £24 10s. per ton less 5%, Liverpool, in casks.

Rubber Chemicals

Antimony Sulphide.—Golden, 6½d. to 1s. 1d. per lb., according to quality. Crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.
Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.
Barytes.—£6 to £7 10s. per ton, according to quality.
Cadmium Sulphide.—7s. to 7s. 3d. per lb.
Carbon Bisulphide.—£31 to £33 per ton, according to quantity, drums extra.
Carbon Black.—3 11/16d. to 4 13/16d. per lb., ex wharf.
Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.
Chromium Oxide.—Green, 1s. 2d. per lb.
Diphenylguanidine.—2s. 2d. per lb.
India-rubber Substitutes.—White, 4½d. to 5d. per lb.; dark, 3¾d. to 4¼d. per lb.
Lamp Black.—£22 to £23 per ton d/d London; vegetable black, £28 to £48.
Lead Hyposulphite.—9d. per lb.
Lithopone.—30%, £16 10s. to £17 5s. per ton.
Sulphur.—£9 to £9 5s. per ton. Sulphur precip. B.P., £55 to £60 per ton. Sulphur precip. comm., £50 to £55 per ton.
Sulphur Chloride.—5d. to 7d. per lb., according to quantity.
Vermilion.—Pale, or deep, 5s. 3d. per lb., 1-cwt. lots.
Zinc Sulphide.—10d. to 11d. per lb., according to quality.

Nitrogen Fertilisers

Sulphate of Ammonia.—Neutral quality, basis 20.6 per cent. nitrogen, delivered in 6-ton lots to farmer's nearest station, £7 5s. per ton.
Calcium Cyanamide.—£7 5s. per ton, carriage paid to any railway station in Great Britain in lots of four tons and over.
Nitro-Chalk.—£7 5s. per ton for delivery to end of June.
Nitrate of Soda.—£7 12s. 6d. per ton for delivery up to end of June.
Concentrated Complete Fertilisers.—£10 12s. to £11 1s. per ton delivered in 6-ton lots to farmer's nearest station.
Ammonium Phosphate Fertilisers.—£10 5s. to £13 15s. per ton for delivery up to end of June, delivered in 6-ton lots to farmer's nearest station.

Coal Tar Products

Acid, Cresylic.—97/99%, 4s. 11d. to 5s. per gal.; 99/100%, 4s. 11d. to 5s. 7d., according to specification; pale 99%, 5s. 1d. to 5s. 2d.; dark, 4s. 6d. to 4s. 8d. Glasgow: Pale, 99/100%, 5s. to 5s. 3d. per gal.; pale 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. to 4s. 3d.; high boiling acids, 2s. 4d. to 2s. 8d. American specification, 4s. to 4s. 3d. Manchester: Pale, 99/100%, 5s.
Acid, Carbolic.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's, 3s. 5d. to 3s. 8d. per gal. Manchester: Crystals, 8½d. per lb. f.o.b. in drums; crude 3s. 8d. to 3s. 9d. per gal. Glasgow: Crude, 60's, 3s. 2d. to 3s. 8d. per gal.; distilled, 60's, 4s. 3d. to 4s. 6d.
Benzol.—At works, crude, 10d. to 10½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d.; pure, 1s. 8½d. to 1s. 9d. Glasgow: Crude, 9½d. to 10½d. per gal.; motor, 1s. 5d. to 1s. 5½d.
Creosote.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. London: 4½d. f.o.r. North: 5d. London. Manchester: 5½d. to 6½d. Glasgow: B.S.I. Specification 5½d. to 6d. per gal.; washed oil, 5d. to 5¾d.; lower sp. gr. oils, 5d. to 5½d.
Naphtha.—Solvent, 90/160%, 1s. 7d. to 1s. 8d. per gal.; 95/160%, 1s. 8d. to 1s. 9d.; 90/190%, 1s. 2d. to 1s. 3d. London: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. Glasgow: Crude, 6d. to 6¾d. per gal.; 90% 160, 1s. 6½d. to 1s. 7½d., 90% 190, 1s. 1d. to 1s. 2d.
Naphthalene.—Crude, whizzed or hot pressed, £11 10s. to £12 10s. per ton; purified crystals, £18 to £20 per ton in 2-cwt. bags. London: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. Glasgow: Fire lighter, crude, £6 to £7 per ton (bags free). Manchester: Refined £22 per ton f.o.b.
Pyridine.—90/140%, 9s. to 10s. per gal.; 90/180, 2s. 9d. to 3s. 6d. Glasgow: 90% 140, 9s. to 10s. per gal.; 90% 160, 7s. to 8s.; 90% 180, 2s. 6d.
Toluole.—90%, 2s. per gal.; pure, 2s. 5d. Glasgow: 90%, 120, 1s. 10d. to 1s. 11d. per gal.
Pitch.—Medium, soft, 36s. to 37s. per ton, in bulk at makers' works. Manchester: 35s. f.o.b., East Coast. Glasgow: f.o.b. Glasgow, 32s. to 37s. per ton; in bulk for home trade, 32s. 6d.
Xylol.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. Glasgow: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

Acetate of Lime.—Brown, £8 10s. to £9 per ton; grey, £10 10s. to £11 10s. Liquor, brown, 30° Tw., 6d. to 8d. per gal. Manchester: Brown, £9 10s.; grey, £11 10s.
Charcoal.—£5 15s. to £11 per ton, according to grade and locality.
Methyl Acetone.—40-50%, £42 to £45 per ton.
Wood Creosote.—Unrefined 6d. to 1s. 6d. per gal., according to boiling range.
Wood, Naphtha, Miscible.—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.
Wood Tar.—£2 10s. to £4 per ton.

Intermediates and Dyes

Acid, Benzoic, 1914 B.P. (ex toluol).—1s. 9¼d. per lb. d/d buyer's works.
Acid, Gamma.—Spot, 4s. per lb. 100% d/d buyer's works.
Acid, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
Acid Naphthionic.—1s. 8d. per lb.
Acid, Neville and Winther.—Spot, 3s. per lb. 100%.
Acid, Sulphanilic.—Spot, 8d. per lb. 100%, d/d buyer's works.
Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.
Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.
Benzidine, HCl.—2s. 5d. per lb., 100% as base, in casks.
m-**Cresol 98/100%.**—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-**Cresol 30/31° C.**—6½d. to 7½d. per lb. in 1-ton lots.
p-**Cresol 34-5° C.**—1s. 7d. to 1s. 8d. per lb. in ton lots.
Dichloraniline.—1s. 11½d. to 2s. 3d. per lb.
Dimethylaniline.—Spot, 1s. 6d. per lb., package extra.
Dinitrobenzene.—7½d. per lb.
Dinitrochlorbenzene, Solid.—£72 per ton
Dinitrotoluene.—48/50° C., 8½d. per lb.; 66/68° C., 10d.
Diphenylamine.—Spot, 2s. per lb., d/d buyer's works
α-**Naphthol.**—Spot, 2s. 4d. per lb., d/d buyer's works
β-**Naphthol.**—9½d. to 9⅝d. per lb.; flake, 9¼d. to 9⅜d.
a-**Naphthylamine.**—Lumps, 1s. per lb.; ground, 1s. 0¼d. in casks.
β-**Naphthylamine.**—Spot, 2s. 9d. per lb., d/d buyer's works in casks.
o-**Nitraniline.**—3s. 11d. per lb.
m-**Nitraniline.**—Spot, 2s. 7d. per lb., d/d buyer's works.
p-**Nitraniline.**—Spot, 1s. 8d. to 2s. 1d. per lb. d/d buyer's works.
Nitrobenzene.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
Nitronaphthalene.—9d. per lb.; P.G., 1s. 0½d. per lb.
Sodium Naphthionate.—Spot, 1s. 9d. per lb., 100% d/d buyer's works.
o-**Toluidine.**—10½d. per lb., in 8/10-cwt. drums, drums extra.
p-**Toluidine.**—1s. 10½d. per lb., in casks.
m-**Xylidine Acetate.**—4s. 3d. per lb., 100%.

Latest Oil Prices

London, May 5.—**Linseed Oil** was firmer. Spot, £31 15s. per ton (small quantities); May, £29 7s. 6d.; June-Aug., £29 10s.; Sept.-Dec., £29 12s. 6d., naked. **Soya Bean Oil** was slow. Oriental (bulk), afloat, Rotterdam, £26 15s. per ton. **Rape Oil** was inactive. Crude, extracted, £36 per ton; technical refined, £37, naked, ex wharf. **Cotton Oil** was quiet. Egyptian crude, £30 per ton; refined common edible, £34 5s.; deodorised, £36 5s., naked, ex mill (small lots, £1 10s. extra). **Turpentine** was firm. American, spot, 38s. 9d. per cwt.
Hull.—**Linseed Oil**, spot, quoted £29 17s. 6d. per ton; May, £29 7s. 6d.; June-Aug., £29 10s.; Sept.-Dec., £29 12s. 6d. **Cotton Oil**, Egyptian, crude, spot, £30 10s.; edible refined, spot, £33 10s.; technical, spot, £33 10s.; deodorised, £35 10s., naked. **Groundnut Oil**, extracted, spot, £32; deodorised, £35. **Rape Oil**, extracted, spot, £35; refined, £36. **Soya Oil**, extracted, spot, £33 10s.; deodorised, £36 10s. **Palm Kernel Oil**, crude, f.m.q., spot, £28 10s., naked, per ton. **Cod Oil**, f.o.r. or f.a.s., 27s. 6d. per cwt., in barrels. **Castor Oil**, pharmaceutical, 45s.; first, 40s.; second, 38s. **Turpentine**, American, spot, 40s. 3d. per cwt.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HILL OIL AND PAINTS, LTD., Wolverhampton. (M., 8/5/37.) April 24, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on premises in Powlett Street, Wolverhampton.

PURO SOAP CO., LTD., Leeds. (M., 8/5/37.) April 23, mortgage and charge, to National Provincial Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Prospect Works, Whitehall Road, Leeds, also general charge.

RAYOID, LTD., London, E.C., celluloid manufacturers, etc. (M., 8/5/37.) April 27, £150 debentures, part of a series already registered.

Satisfactions

BRITISH INDESTRUCTO GLASS, LTD., London, E.C. (M.S., 8/5/37.) Satisfactions April 22, of debentures registered October 29, 1936, to extent of £3,925, £6,900 and £5,675; also April 26, £3,000, registered July 29, 1929, and £2,700, registered February 2, 1937.

JOHN GREENE AND SONS (GATESHEAD), LTD., oil merchants, etc. (M.S., 8/5/37.) Satisfaction April 26, £200 (not ex.), registered Sept. 27, 1932.

JOHNSON AND SONS, MANUFACTURING CHEMISTS, LTD., London, N.W. Satisfaction April 27, of mortgage registered Dec. 3, 1921.

SYNPLAS, LTD., London, N.W., plastic moulding manufacturers. (M.S., 8/5/37.) Satisfaction April 27, of debenture registered October 29, 1936.

Voluntary Liquidation

C. E. HAMPSON, LTD., soap manufacturers, Ardwick, Manchester.—At the statutory meeting of creditors it was reported that the liabilities were £366. After allowing £21 for preferential claims the net assets were £65, or a deficiency, so far as the creditors were concerned, of £301. The assets comprised: Stock £95, valued at £25; machinery £25; fixtures £25; and book debts £11. The company was registered in April, 1934, the issued capital being £450. During the year to May, 1935, the turnover was £933, with a loss of £308, and in the following six months there was a net loss of £455 on a turnover of £531. Between November, 1935, and December last, the sales still further declined and there was a net loss of £1,139. It was estimated that during the present year there had been a further loss on trading of £330. From time to time substantial loans had been made to the company, but those amounts had not been included in the statement of affairs. Resolutions were passed confirming the voluntary liquidation of the company, with Mr. R. Peters, accountant, Urmston, as liquidator.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Dusarit. 571,892. Water softening preparations. United Water Softeners Limited, Permutit House, Gunnersbury Avenue, London, W.4. September 28, 1936.

Lexol. 570,879. Sulphonated fatty alcohol, for soaping-off textiles in course of manufacture. George Harry Briggs, Commercial Street, Knott Mill, Manchester, 15. August 13, 1936.

Aluol. 571,349. Artificial resins being chemical substances for use as ingredients in manufacture; lacquers and varnishes included in Class 1. Albert Products Ltd., 177 West Street, Erith, Kent. September 3, 1936.

Synsolve. 571,761. Nitro cellulose and cellulose acetate solvents, being chemical substances for use in manufactures. Synthite Limited, Wood Street Works, Wood Street, Ryders Green, West Bromwich, Staffordshire. September 23, 1936.

Microsul. 568,323. Sulphur for use in manufactures. W. H. Cowburn & Cowpar, Limited, Textilose Road, Trafford Park, Manchester 17. April 25, 1936.

Eulysin. 570,643. Chemical substances in liquid form for use in the finishing of textiles in the course of manufacture. I.G. Farbenindustrie, Grüneburgplatz, Frankfort-on-Main, Germany. July 30, 1936. Address for service in the United Kingdom is: c/o Abel and Imray, 30 Southampton Buildings, London, W.C.2.

Vinsol. 571,931. Resin. Hercules Powder Co., Market Street, Wilmington, Delaware, United States. September 30, 1936. Address for service in the United Kingdom is. c/o Marks & Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2.

Forthcoming Events

LONDON.

May 11.—Society of Chemical Industry. Road and Building Materials Group. Annual general meeting. "The Fire Resistance of Modern Buildings." W. W. Davies. 8 p.m. Burlington House.

May 14.—The Physical Society. Ordinary meeting. 5 p.m. Imperial College of Science and Technology, South Kensington.

Company News

Graphite Oils.—Profit for 1936 amounted to £410 (£849); deducting costs and expenses in connection with reduction of share capital £155 this leaves £255 forward.

Stevenson and Howell.—Net profit for 1936 was £40,705 (£50,071), add £89,485 brought in, making £130,190; final dividend 12 per cent., tax free, making 17 per cent., tax free (19 per cent.); forward, £91,810.

Reckitt and Sons.—A quarterly on 4½ per cent. and 5 per cent. preference and interest on 4 per cent. debenture, together with interim of 1s. per share (same) on ordinary, will be paid July 1 to all holders registered in books on May 29.

International Nickel.—A quarterly dividend of 50c. per share on the common stock, payable June 30 to holders of record June 1, has been announced. This makes $1 per share on the common stock to date for the year to end December next, a similar payment having been made in March last, and compares with a dividend of 30c. per share at this time last year.

British Match.—A final dividend of 5 per cent., less tax, at 4s. 5.72d. in the £, on the ordinary, making 7¾ per cent., less tax, for the year to April 30, 1937, the same as in 1935-36, has been declared. A final dividend at the rate of 5½d. per cent., per annum, less tax, at 4s. 3.9d., is also announced on the preference shares.

British Oxygen.—A scrip bonus of one share for every £15 of ordinary stock, which is equivalent to 6⅔ per cent., and a final dividend of 8 per cent., payable on the ordinary stock as increased by the proposed bonus issue, has been recommended. An interim dividend of 7 per cent. was paid on ordinary stock amounting to £2,485,674, following which the amount of ordinary stock in issue was increased by £170,000 to £2,655,674 as a result of the acquisition of the Quasi-Arc Co. from Turner and Newall. The total distribution for the year is thus 15 per cent., less tax.

Books Received

Barium Minerals. By J. Simpson. London: Imperial Institute. Pp. 48. 2s.

Synthetic Rubber. By W. J. S. Naunton. London: Macmillan and Co., Ltd. Pp. 160. 7s. 6d.

Chemistry: A Brief Outline of its History and Development. Part 1.—Historical Review. By A. Barclay. London: The Science Museum. Pp. 70. 1s. 6d.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Egypt.—The Commercial Counsellor to the British Embassy at Cairo reports that the Ministry of Public Health, Cairo, is calling for tenders to be presented in Egypt by May 26 for the supply of various kinds of bottles, jars, india-rubber tubes, corks, paper bags for powder, filtering papers, oiled papers, litmus paper envelopes and cylinders for oxygen gas. (Ref. No. T.Y. 31338.)

Iraq.—A Bagdad firm wishes to represent United Kingdom manufacturers of paints and linseed oil. (Ref. No. 133.)